Environmental Protection Act 1990, Part 2A: Detailed Site Investigation

Landfill site off Brownhills Road and Walsall Rd, Norton Canes, Staffordshire

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Prepared for:

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1 INTRODUCTION

1.1 Terms of Reference

In January 2010, Grontmij Limited (Grontmij) was appointed by Cannock Chase District Council (the Council) to assist in the implementation of the Council's Part 2A Contaminated Land inspection strategy. Part 2A of the Environmental Protection Act 1990 (Part 2A) requires each local authority to inspect areas of land which it believes may constitute Part 2A Contaminated Land.

Grontmij assisted the Council to prioritise a list of sites which could constitute Part 2A contaminated land for inspection, on the basis of the Council's Part 2A Inspection Strategy. The site subject to this report, located off Brownhills Road and Walsall Road, Norton Canes, Staffordshire (hereafter referred to as 'the site') was identified as a priority for inspection as:

- The site comprises an area of land which appears to have been infilled with waste material
- The site is considered to be sensitive as 95 residential properties with gardens overly the inferred extent of landfill and the site is underlain by a secondary A aquifer.

Following the completion of a desktop study (see Appendix A) and a successful application for funding from DEFRA, Grontmij was subsequently appointed by the Council to implement a site investigation, which was undertaken in July 2010. This report presents the findings of the detailed investigation, assesses the significance of the contaminant concentrations detected, and makes recommendations for further work.

This report is subject to the limitations presented in Appendix B.

2 BACKGROUND INFORMATION

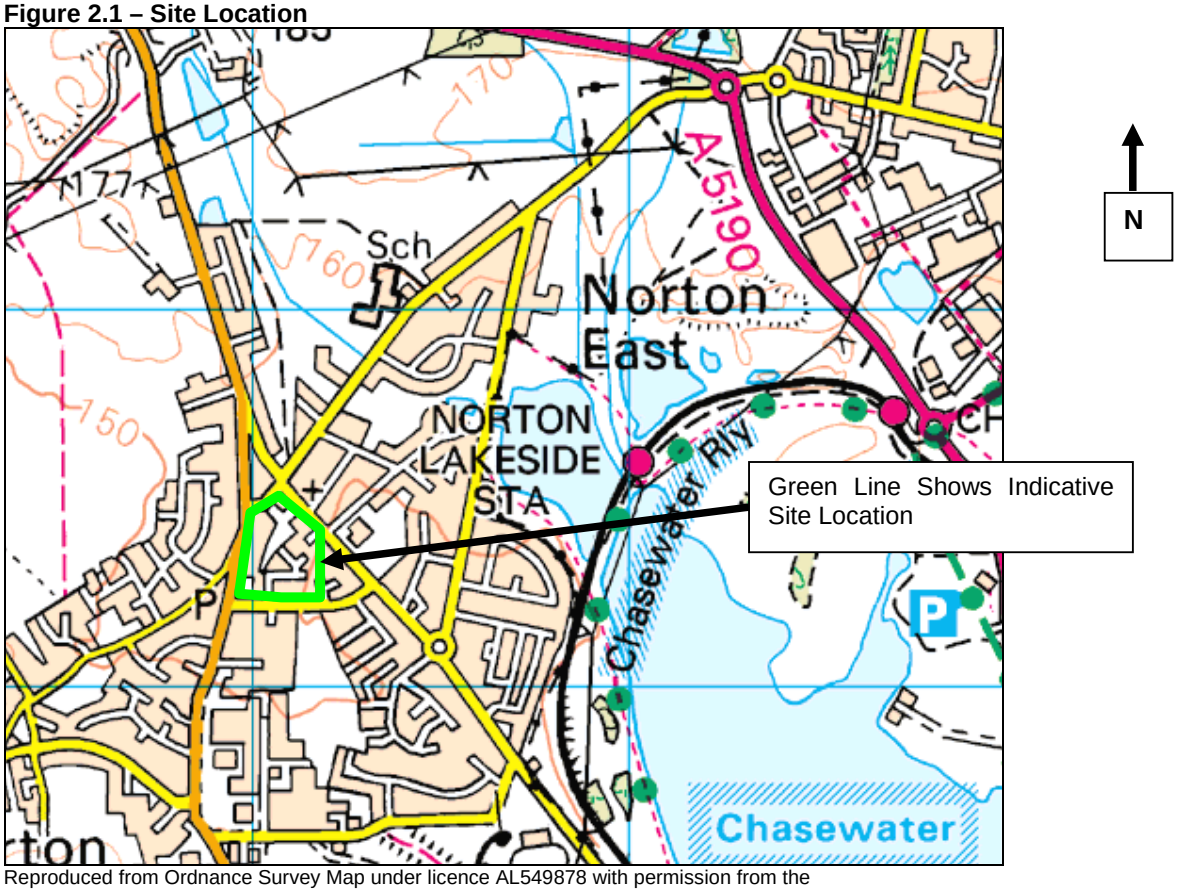
2.1 Site Setting

The site's setting and location are summarised in Table 2.1 and Figure 2.1.

Table 2.1 – Site Setting

Data	Information
Address	Land between Brownhills Rd and Walsall Rd, Norton Canes, Staffordshire, WS11 9TD
Current site use:	Residential houses and gardens.
Grid Reference:	Site centre is approximately located at 402067, 308359.
Site Area:	Approximately 1.5 ha.
Topography:	Site slopes gently towards west.
Surrounding land use	North: residential properties, small scale commercial premises and a doctors surgery adjacent East: residential properties adjacent, with school and playing fields @ 150m South: commercial buildings and open land adjacent West: residential properties and open land adjacent
Geology	British Geological Survey (BGS) information indicates that the site is underlain by Boulder clay over Middle Coal Measures The likely thickness of deposits is not stated.
Hydrogeology	The coal measures are regarded as a secondary aquifer by the Environment Agency.
Source Protection Zones (SPZs)	The Environment Agency website indicates that the site does not lie within a SPZ.
Surface Waters	A stream is located 300m north-east of the study site. Chasewater (a large lake) is located 500m to the east, and a further stream is located 500m to the west
Historical Land Use	The Study Site formerly comprised part of the Conduit Colliery. Conduit Colliery Company had several collieries in the Norton Canes/Brownhills area. The colliery sinking began in 1858 and the last shaft was closed in 1962. The information provided indicates that after closure of the colliery the site was operated and infilled as a landfill. The site was subsequently redeveloped for residential and small-scale commercial purposes. There is no information about the site's license, operational period or the date the site was developed on Environment Agency "What's In Your Back Yard" website.
Ecological Receptors	A MAGIC search identified that there are no ecological receptors, as listed in the Contaminated Land Regulations 2006, on site or within a 250m radius of the site boundary

Figure 2.1 – Site Location



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2.2 Previous Reports

Grontmij has previously completed a desktop assessment of the site, as presented as Appendix A. The assessment included the review of on-line data resources, in-house mapping and records provided by the council, and a site walkover.

The desk study report included an initial Conceptual Site Model (CSM) of potential pollutant linkages, developed in accordance with the model procedures[1], and statutory guidance[2]. The CSM is re-presented as Table 2.2 overleaf.

[1] CLR11 Model Procedures for the Management of Land Contamination (EA & DEFRA September 2004)
[2] DEFRA Circular 02/2006, Environmental Protection Act 1990: Part IIA Contaminated Land:, September 2006.

Table 2.2 – Preliminary Conceptual Side Model (prior to intrusive investigation)

No.	Receptor	Contaminant(s)	Pathway(s)	Risk of Pollutant Linkage Being Realised	Comments
1	Residents of properties above infilled ground – including children playing in gardens & vegetable consumption	Contaminants including (but not limited to) metals, hydrocarbons, PAHs, VOCs, SVOCs within the made ground.	Direct ingestion/dermal contact/inhalation of dust/inhalation of vapours/consumption of home-grown vegetables	Medium to High	Grass and/or topsoil coverage likely to mitigate risk to an extent – risk is greatest where possibly impacted soils are exposed or could be encountered, for example, when digging a vegetable patch or when children play outdoors. Properties are constructed directly above a potentially significant contamination source.
2		Methane and carbon dioxide from decomposition of deleterious elements of the made ground.	Movement into buildings, subsequent asphyxiation and explosion risk.	Medium to High	Investigation and monitoring required to determine risk.
3	Subsurface services serving the buildings (principally water supply)	Contaminants including metals, hydrocarbons, PAHs, VOC, SVOCs within the made ground.	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Medium	Risk will depend on depth and concentration of contaminants and material(s) used for water pipes.
4	Property (Structures) – sub-surface concrete	Sulphate and pH	Contact between contaminants and concrete.	Medium	Possible risk but could only reasonably be established if concrete class used to construct buildings can be established (unlikely) – more relevant for any new planned buildings.
5	Minor aquifer beneath site	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Leaching of chemicals to aquifers	Medium	Risk will depend upon depth and concentration of contaminants, presence/absence of confining layers between contaminants and the aquifers, leaching potential etc. Site data needed.
6	Surface waters (closest wasters: a stream 300m northeast, Chasewater (large lake) 500m to east and a further stream 500m west of the study site)	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Groundwater flow in permeable strata which are in continuity with watercourses	Low to Medium	Risk depends on depth/presence of contaminated groundwater, hydraulic gradient within any impacted groundwater unit, and continuity between impacted groundwater and watercourse. .

3 DETAILED INTRUSIVE INVESTIGATION

In order to further examine the potential pollutant linkages identified in Table 2.2, and following a successful application for DEFRA funding, a detailed site investigation was undertaken on the 7th to 9th July and 12th July 2010. This section describes the site investigation undertaken and results obtained.

3.1 Scope and Methodology

The intrusive site investigation included the following:

- A consultation exercise with residents living at the site, including a mailshot and a public open evening;
- Obtaining plans of underground services and CAT-scanning proposed drilling locations, using a Radiodetection CAT1 and signal generator;
- Drilling ten hand held or machine-driven window sample holes (WS1 – WS8) to a maximum depth of 5.0m bgl, at the locations shown on Drawing 1. The window sample holes, which were drilled by Sherwood Drilling Services, were positioned in the rear gardens of housing located above the extent of infill, as indicated on historical mapping. Borehole positions were selected on the basis of achieving good coverage of the site. The purpose of the window sample holes was to examine shallow and deeper soil conditions, enable the retention of samples for laboratory testing, and facilitate the installation of 50mm diameter dedicated gas monitoring wells in each borehole;
- Logging soil arisings in accordance with BS5930:1999, and additionally noting any visual or olfactory evidence of potential contamination;
- Retaining representative soil samples of the strata encountered, which were selected on the basis of field observations of potential contamination and achieving good spatial and depth coverage of the site
- Submitting retained samples to Alcontrol Geochem in cooled coolboxes and under full chain of custody documentation, and instructing the analysis of samples, and;
- Undertaking four ground gas monitoring rounds, using a Geotechnical Instruments GA2000 gas analyser and flow pod.

3.2 Results

3.2.1 Ground Conditions

The ground conditions encountered at the site generally comprised Made Ground over interbedded cohesive (clay) and granular (sand and gravel) deposits, as described below:

Made Ground
Made Ground was encountered to depths ranging between 0.3m bgl (in WS J, in the north-western part of the site) and 3.5m bgl (in WS A, in the south-eastern part of the site). The made ground was typically encountered as (turf over) clayey sand with abundant gravel and cobbles. The gravel and cobble content included brick, ceramics, burnt shale, ash, quartz, slag, coal, diorite, weathered sandstone. Occasional fragments of plastic were also noted.

Superficial Deposits
Superficial deposits were encountered within all exploratory holes, beneath the made ground. The deposits were typically encountered as firm to stiff sandy gravelly CLAY overlying silty coarse SAND and GRAVEL, the gravel content typically being quartz. The clay layer was not encountered in boreholes G, H and J (all generally located towards the north-western part of the site), where the made ground was directly underlain by sand and gavel deposits.

Carboniferous Coal Measures
Evidence of coal measures strata, which typically comprise interbedded mudstone and sandstone with coal seams, was not encountered during the site investigation.

Groundwater
Groundwater was not observed during drilling.

The above findings are discussed further in Section 4 (updated CSM). Window sampler hole logs, providing full details of the strata encountered, are included within Appendix C.

3.2.2 Field Evidence of Contamination

The drilling arisings were inspected for visual and olfactory evidence of potential contamination. A summary of field observations recorded is presented in Table 3.1:

Table 3.1 – Field Evidence of Potential Contamination

Exploratory Hole	Visual and Olfactory Evidence of Contamination
WS A	Ash, burnt shale and slag within made ground, 0.3m to 3.5m bgl
WS B	Occasional plastic in made ground, GL to 0.53m bgl
WS C	Ash and clinker within made ground, GL to 1.16m bgl
WS D	Occasional ash within made ground, GL to 0.89m bgl
WS E	Ash within made ground, GL to 0.9m bgl
WS F	Ash within made ground, GL to 0.6m bgl
WS G	Ash within made ground, 0.2m to 0.5m bgl
WS H	Ash and slag within made ground, 0.2m to 2.52m bgl
WS J	None
WS K	Ash and burnt shale within made ground, GL to 1.48m bgl

EOB = end of borehole GL = ground level

3.2.3 Soil Analysis Results

Seventeen samples were submitted for laboratory analysis, under full chain of custody documentation and within chilled coolboxes, to ALcontrol Geochem of Deeside. ALcontrol is UKAS accredited and holds MCERTS accreditation for most analyses performed. The samples were selected for analysis on the basis of the observations of potential contamination made in the field, and to achieve good spatial coverage of the site.

Table 3.1 presents a summary of the analysis results. The results have been compared to screening values protective of human health, assuming the receptor is a residential property where plant uptake of contaminants occurs, and the plants are subsequently ingested by humans. The screening values used in preference comprise:

- 2009 Soil Guideline Values (SGVs) published by the Environment Agency / DEFRA, generated using the latest Contaminated Land Exposure Assessment (CLEA) model, version 1.06

- Generic Assessment Criteria (GAC) published by Land Quality Management Limited (LQM) or the Environmental Industries Commission (EIC), or calculated by Grontmij, all using CLEA 1.06
- SGVs published by the Environment Agency / DEFRA between 2002 and 2007, calculated using prior versions of the CLEA model.

Full analytical testing results are included as Appendix D.

Table 3.1 – Soil Analysis Results Summary

Determinand	No. of Samples Tested	Minimum Value	Maximum Value	SGV / GAC (using 6% SOM where SOM-dependant)[1]	Locations where SGV or GAC are exceeded
Arsenic	15	6	29	32	-
Antimony	15	2.3	4.2	550	-
Barium	15	65	250	1300	-
Beryllium	15	0.69	4.1	51	-
Boron (water-soluble)	15	1	4.6	291	-
Cadmium	15	0.1	2.3	10	-
Chromium, hexavalent	15	<0.6	<1.2	4.3	-
Chromium, total	15	14	33	3,000	-
Copper	15	18	100	2,330	-
Lead[2]	15	12	250	450	-
Mercury[3]	15	<0.14	0.16	1.0	-
Nickel	15	16	53	130	-
Selenium	15	1	1.7	350	-
Vanadium	15	19	72	75	-
Zinc	15	44	700	3,750	-
Cyanide	5	<1	<1		-
Thiocyanate	5	<1	1.6		-
Asbestos screen and ID	**5**	**One sample contained chrysotile asbestos fibres; laboratory comment was "typical of a fragment of asbestos cement". The other four samples did not contain asbestos fibres**			
Benzene	7	<0.01	0.02	0.33	-
Toluene	7	<0.01	0.02	610	-
Ethyl Benzene	7	<0.01	0.02	350	-
Xylene[4]	7	<0.01	<0.01	230	-
TPH – CWG[5]	7	0.43	330	n/a	-
Phenols	5	<0.01	0.01	420	-
Benzo(a)pyrene	**5**	**0.19**	**1.3**	**1.0**	**WS A (0.3m) and WS G (0.3m)**
PAHs other than B(a)p	5	No individual PAH screening values exceeded, with exception of benzo(a)pyrene – see above			-
VOCs and SVOCs (excl above)	5	No screening values exceeded, where such screening values have been published			-

Values presented in mg/kg, correct to two significant figures (screening values presented without any rounding). **Bold values** indicate locations where observed concentrations exceed the screening value. PAH = Polyaromatic hydrocarbons. VOC = Volatile Organic Compounds. SVOC = Semi-Volatile Organic Compounds.

[1] Fifteen samples were tested for Soil Organic Matter (%SOM) content. A minimum value of 0.55% and a maximum of 29% were recorded, with a mean of 9.9% and a median of 8.4%. It is therefore justified, to use the SGVs and GAC generated using a 6% SOM value in CLEA in an initial screen. Incidentally, if 1% SOM is adopted, the corresponding benzo(a)pyrene screening value (0.83mg/kg) is exceeded by the same two test results as exceeded at 6% SOM.

[2] SGV quoted was generated by DEFRA using earlier version of CLEA. A value using the latest version of CLEA is awaited

[3] Testing results presented represent total mercury. SGV presented is for elemental mercury, the most stringent of the elemental, inorganic and methyl mercury SGVs

[4] SGV for para-xylene quoted (worst case of the three isomers)

[5] Testing values quoted are for total TPH across all aromatic and aliphatic bands (C5-C35). None of the TPH-CWG screening criteria for individual aliphatic and aromatic bands were exceeded by the corresponding banded analyses

The concentration of benzo(a)pyrene in one soil sample exceeds the generic screening values adopted. Additionally, asbestos fibres were detected in one sample. The significance of these results are discussed in more detail in Sections 4 and 5.

3.2.4 Ground Gas Monitoring

Four rounds of ground gas monitoring were undertaken, using a Geotechnical Instruments GA2000 gas analyser with flow pod. A summary of the gas monitoring results is presented in Table 3.2 below, with full monitoring data in Appendix E:

Table 3.2 - Summary of Gas Monitoring Data

Well	Maximum Values Recorded During Monitoring Events:					Gas Screening Value[1] (l/hr)	Situation "A" Characteristic Situation[1]
	Peak CH_4 (%)	*Steady CO_2 (%)*	*Steady CO (ppm)*	*Steady H_2S (ppm)*	*Flow (l/hr)*		
WS A	<DL	4.7	0	0	0.1	0.005	1
WS B	<DL	15.3	0	1	0.1	0.015	1
WS C	<DL	1.8	0	0	0.1	0.002	1
WS D	<DL	5.7	0	0	0.1	0.006	1
WS E	<DL	2	0	0	0.1	0.002	1
WS F	<DL	1.6	0	0	0.1	0.002	1
WS G	<DL	5.2	0	0	0.1	0.005	1
WS H	<DL	6.4	2	0	0.1	0.006	1
WS J	<DL	1.4	0	1	0.1	0.001	1
WS K	<DL	3.5	0	0	0.1	0.004	1

Atmospheric Pressure:		
	28/07/2010	996mb (steady trend throughout day)
	11/08/2010	991mb (rising trend throughout day)
	25/08/2010	993mb (falling trend throughout day)
	08/09/2010	982mb (rising trend throughout day)

Readings were obtained during a 3 minute measurement period, and were obtained with a Geotechnical Instruments GA2000 gas analyser plus flow pod.
CH_4 – methane; O_2 – oxygen; CO_2 carbon dioxide; CO – carbon monoxide;
H_2S – hydrogen sulphide; mbgl – metres below ground level mb – millibars l/hr – litres per hour.
<DL – reading below instrument's detection limit
[1]CIRIA Characteristic Situation based on methodology presented in CIRIA Report C665, Assessing Risks Posed by Hazardous Gases to Buildings. Where the flow rate recorded in the field is zero or negative, a flow of 0.01 l/hr is assumed

The summary data presented above indicates that, in regard to methane and carbon dioxide, characteristic situation 1 should be applied. This is the lowest risk category (of six) presented in CIRIA report 665, and indicates that no special gas precautions would be required in the construction of new buildings. It can be inferred that there is no requirement to examine whether gas protection measures fitted to existing buildings at the site.

Additionally, carbon monoxide and hydrogen sulphide concentrations were generally below the gas analyser detection limit, indicating that the toxic inhalation risks posed by these gases is very low. The low concentrations recorded on occasions were below available screening values (workplace occupational exposure values published in Health and Safety Executive document EH40/2005).

3.2.5 Safety of Water Supply Pipes

The soil quality data obtained has been screened against Water Regulations Advisory Scheme (WRAS) thresholds, above which "special consideration of the material used" for the water pipe should be given. The results of the screening exercise are presented in Table 3.3 below.

Table 3.3 - WRAS Threshold Screen

Analyte	WRAS Threshold Value (mg/kg)	Maximum Test Result (mg/kg)
Sulphate	2000	Not analysed
Sulphur	5000	Not analysed
Sulphide	250	Not analysed
pH	<5 or **>8**	6.6 – **8.2**
Antimony	10	4.2
Arsenic	**10**	**29**
Cadmium	3	2.3
Chromium (hexavalent)	25	<1.2
Chromium (total)	600	33
Cyanide (free)	25	<1
Cyanide (complexed)	250	<1
Lead	500	250
Mercury	1	0.16
Selenium	3	1.7
Thiocyanate	50	1.6
Coal Tar	50	Not analysed
Cyclohexane extractable	50	Not analysed
Phenol	5	0.01
Polyaromatic Hydrocarbons	50	11
Toluene extractable	50	0.02
Petroleum Hydrocarbons	**50**	**330**

The maximum concentrations of arsenic and petroleum hydrocarbons, and the maximum soil pH level recorded, exceed the WRAS threshold values. Further investigation of the materials used for water supply pipes at the site, and possibly testing for further analytes, will be required.

The results of the intrusive investigation and monitoring are discussed in more detail in the following section.

4 UPDATED CONCEPTUAL SITE MODEL

4.1 Introduction

The CSM presented in the earlier Grontmij desk study report (Appendix A) was updated, using the findings of the site investigation, as presented in the following sections.

4.2 Contaminants

The “contaminants” term in the conceptual model has been evaluated by comparing the chemical analysis results obtained during the site investigation with published generic screening values (Tables 3.1, 3.2 and 3.3).

The following contaminants were detected in soil at concentrations in excess of the screening values relevant for a residential site with plant uptake:

- Benzo(a)pyrene
- Asbestos fibres were also identified in one sample

The following contaminants were detected in soil at concentrations in excess of WRAS standards, protective of water distribution pipework:

- Arsenic, petroleum hydrocarbons and soil pH

Low gas concentrations and flow rates were recorded, resulting in a characteristic situation 1 regime and indicating that ground gas poses a very low risk to residents at the site.

4.3 Receptors

Table 4.1 indicates the receptors considered to be present at the site. The critical human receptor is the on-site resident; while off-site residents and commercial workers are also present, the concentrations of contaminants and, in the case of commercial workers, their exposure frequency and duration, is likely to be less than on-site residents, and are not considered further.

See Appendix A (desk study report) for a detailed discussion of the receptors included in the conceptual model.

4.4 Pathways

Pathways (pollutant linkages) are also examined as part of Table 4.1, overleaf.

Table 4.1 – Pollutant Linkages, Post-Site Investigation

Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage[1]	Probability of Linkage Occuring[1]	Overall Risk[1]	Comments
Residents of properties above infilled ground – including children playing in gardens	Concentration of benzo(a)pyrene in made ground, in two samples taken at 0.30m bgl, exceed generic screening value	Direct ingestion/dermal contact/inhalation of dust/inhalation of vapours/consumption of home-grown vegetables	Medium	Likely	Moderate	Risk rating could be refined by statistical analysis and/or a sanity check of risk – see Section 5
	Chrysotile asbestos fibres encountered in one sample taken from 0.3m bgl within made ground (the four other samples analysed were negative for asbestos)	Inhalation of fibres when ground is disturbed (e.g. digging) – risk of asbestosis	Medium	Low	Low / moderate, but requires further assessment	Risk is potentially tolerable, given likely lifetime burden of asbestos fibres (see Appendix G) and comparably low likely frequency that the fibres would be disturbed (e.g. when digging a vegetable patch). However, further sampling is recommended, to give increased comfort that asbestos is not widespread. See Section 6
	Methane, carbon dioxide, H2s, CO in ground. Gases being generated at low flow rates and typically at low concentrations, resulting in characteristic situation 1.	Movement into buildings, subsequent asphyxiation and explosion risk.	Severe	Unlikely	Low/moderate	No further assessment required (risk level of "low/moderate" is the lowest possible rating where the potential severity of the hazard is considered "severe")

Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage[1]	Probability of Linkage Occuring[1]	Overall Risk[1]	Comments
Subsurface services serving the buildings (principally water supply)	Concentrations of arsenic and hydrocarbons, and soil pH value, within made ground exceed (the very stringent) WRAS guideline values	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Medium	Low	Low/moderate	South Staffordshire Water has confirmed that contaminant resistant pipework is always laid where laboratory testing results (carried out by South Staffordshire Water) indicate the need. The water company also carries out routine testing of water quality at consumer taps (odour and taste assessment), and investigates any problems identified. As a precaution, Cannock Chase District Council has written to South Staffordshire Water to ask that properties within the site are included on a routine testing schedule. The water company has responded to indicate that such testing is not routinely undertaken, but any problem would potentially be detected by routine taste and odour monitoring (particularly in regard to hydrocarbons). To confirm the current exposure to residents, it is proposed that analysis of tap water samples is undertaken, with the results compared to UK drinking water standards. See Section 7
Secondary aquifer beneath site (Coal Measures)	Contaminants identified within made ground	Leaching of contaminants through unsaturated zone (Made Ground and superficial deposits) to the aquifer, in the parts of the site where the coal measures are not overlain by clay deposits	Mild	Low	Low	As clay underlies the made ground in parts of the site, the coal measures are likely to contain significant low permeability mudstone layers, and the coal measures aquifer is of low sensitivity (i.e. unlikely to be abstracted from for drinking water purposes), the “low risk” conclusion is justified. No further assessment is considered necessary

Receptor	Contaminant(s)	Pathway(s)	Potential Severity of Linkage[1]	Probability of Linkage Occuring[1]	Overall Risk[1]	Comments
Surface waters – closest is stream, 300m to north-east	Contaminants identified within the made ground	Lateral migration of any impacted shallow groundwater within Made Ground to surface watercourse	Medium	Unlikely	Low	No groundwater was identified during drilling, indicating that a significant and continuous shallow groundwater unit is not present. Distance of receptor from source means that significant attenuation and dispersion of any mobile dissolved contaminants is likely to occur on the flowpath to the receptor, meaning any dissolved contaminants are likely to be at acceptable concentrations if they reach the receptor No further assessment necessary

[1] Taken from Table 6.3, CIRIA report 652 (Contaminated Land Risk Assessment – A Guide to Good Practice. Severity classified as minor, mild, medium or severe. Probability classified as unlikely, low, likely or high. Overall risk considers both the severity and probability of the linkage (very low, low, moderate, high or very high). See Appendix F for further details

5 STATISTICAL ANALYSIS OF HUMAN HEALTH RISK

The site investigation has established that the concentration of benzo(a)pyrene (hereafter "contaminant of concern" or "COC") in shallow soils exceeds generic screening values applicable to the generic residential housing scenario, where plants are grown for human consumption.

Generic SGVs and GAC are used to examine whether significant possibility of significant harm ("SPOSH" - i.e. unacceptable risk to human health or the environment) *may* be posed at any given site in England or Wales. The SGVs and GAC have been derived using the CLEA model by various parties (see Section 3.2.3), using conservative input parameter values to generate screening values applicable, theoretically, to all UK sites. Therefore, an exceedance of a SGV or GAC does not necessarily mean that SPOSH exists - only that the generic, conservative screening value has been exceeded, and further assessment is required. The first step of detailed analysis taken comprises a statistical assessment of the data obtained.

5.1 Statistics and Part 2A

Guidance regarding how data collection, data review and statistical testing interact to produce defensible conclusions regarding the condition of land is provided within Part 2A of the Environmental Protection Act 1990 and *Guidance on Comparing Soil Contamination Data with a Critical Concentration*[3] *("the guidance")*. The core concept behind this guidance, with respect to potential Part 2A sites, is whether the level of contamination identified on a site can be confidently assessed as high compared to a suitable measure of risk, for example SGVs, GAC or site-specific assessment criteria (SSAC) derived by a quantitative risk assessment.

The statistical testing approach requires that the assessment of the significance of the identified contamination is addressed through the use of formal hypotheses, the Null Hypothesis (H_0) and the Alternative Hypothesis (H_1). Statistical tests are formulated in order to be able to demonstrate, at a particular level of confidence (typically 95%), which of the hypotheses is most likely to be true in a given situation. In the investigation of potential Part 2A sites, the guidance identifies that the Null and Alternative Hypotheses are as follows:

- H_0: the level of contamination at the site is the same as or lower than the critical concentration; and
- H_1: the level of contamination at the site is higher than the critical concentration.

Part 2A decisions can be made on the basis of the 'balance of probabilities'. As a consequence, if the Null Hypothesis cannot be rejected at the 95% confidence level, defensible decisions can still be made at a lower confidence level of 51% or more.

The *Guidance on Comparing Soil Contamination Data with a Critical Concentration* document provides suggested methods of analysing site investigation data, including appropriate statistical tests depending on the distribution of the data.

[3] The Chartered Institute of Environmental Health, CL:AIRE and The Soil and Groundwater Technology Association; May 2008.

5.2 Statistical Testing Methodology

The statistical analysis was completed in accordance with the principles and methods identified in *Guidance on Comparing Soil Contamination Data with a Critical Concentration.*

5.2.1 Averaging Areas

Based on the history and current nature of the site, statistical analysis was completed on all soil chemical data from the site, which was analysed as one dataset.

5.2.2 Contaminants of Concern Analysed

The concentration of benzo(a)pyrene recorded at the site was subjected to statistical analysis in order to determine its significance.

5.2.3 Database Size and Validity

Five benzo(a)pyrene analyses were undertaken as part of the investigation. The database size (n = 5) is low. However, a preliminary statistical analysis has been undertaken, as described below.

5.2.4 Dataset Management

In accordance with the guidance, chemical analysis results recorded below the laboratory Method Detection Limit (MDL) were replaced within the dataset with values equal to the MDL in order to be conservative.

5.2.5 Sample Mean and Critical Concentration

The initial stage of the statistical testing involves analysis of the relationship between the dataset sample mean and the critical concentration (C_c) for each CoC. If the CoC sample mean is less than the C_c (equal to the SSAC for the particular CoC), the 95 % lower confidence limit of the sample mean must also be less than the C_c and consequently the Null Hypothesis cannot be rejected.

Comparison of the sample means with the C_c has been completed for the CoC using the SSAC calculated for residents at the site with consumption of home-grown vegetables, as summarised in Table 5.1:

Table 5.1 - Comparison of Sample Mean with Critical Concentration

CoC	Sample Size	Sample mean (mg/kg)	C_c (SGV or GAC) (mg/kg) [2]	Test Result
Benzo(a)pyrene	5	0.68	1.0	Sample mean < C_c

Notes:
C_c = Critical concentration - equates to the SGVs or GAC adopted in the initial data screen undertaken in Table 3.2

The initial statistical analysis identified that the sample mean was less than the critical concentration for all CoCs, and thus, the Null Hypothesis cannot be rejected. The average concentration of all CoCs is therefore unlikely to be greater than C_c, and all CoCs can be discounted.

5.3 Discussion

Statistical analysis has been completed. The statistical analysis identified that the sample mean is less than the critical concentration, and therefore H_0 should not be rejected for these CoC. Consequently, no further consideration of the CoC, including identification of possible outliers, was necessary.

The number of samples tested for benzo(a)pyrene (5), whilst proportionate to the scope of the investigation undertaken, is not particularly high, given the area of the site. Further sampling and analysis would improve the confidence in the above conclusion (see below).

5.4 Improving Confidence in Results - Additional Testing for PAHs

In order to have further confidence in the findings of the statistical analysis, and the conclusion that the health of on-site residents is unlikely to be affected by benzo(a)pyrene, five further shallow soil samples were collected from the site on 10th December 2010. in order to provide good coverage of the site, and compliment the benzo(a)pyrene testing already undertaken, the samples were taken from the following addresses:

- 166 Walsall Rd
- 1 Yew Tree Close
- 23 Yew Tree Close
- 2 Jerome Drive
- Public open space to the south of the car parking area serving the Co-Op store

The samples were submitted to Alcontrol Geochem for analysis for PAHs (to include benzo(a)pyrene). The analysis results are summarised in Table 5.2, along with the previous PAH analytical data obtained:

Table 5.2 – Summary of all Benzo(a)pyrene Testing Results

Contaminant	No of Samples Tested	Minimum Value	Maximum Value	Mean Value	Critical Concentration
Benzo(a)pyrene	10	<0.10	1.25	0.70	1.0

All result presented in mg/kg

The concentrations of all other PAH compounds remained below their respective critical concentrations.

5.5 Results and Conclusion

The mean benzo(a)pyrene concentration remains below the critical concentration of 1.0mg/kg, giving further confidence that H_0 should not be rejected. In other words, it is likely that the true mean concentration of benzo(a)pyrene at the site is lower than the critical concentration.

The concentrations of all their PAHs remain low, and no further assessment is necessary.

6 ADDITIONAL ASBESTOS SAMPLING

6.1 Introduction

As the single made ground sample obtained from a single property tested positive for asbestos fibres, further samples were taken from the property to determine whether asbestos is potentially widespread within the garden, or the initial positive result was atypical of the garden as a whole.

The residents of the property were visited in person prior to the planning of the site work, in order to explain the purpose of further sampling. During the visit to the property, the householders showed photographs of the house under construction; no evidence of potential bulk asbestos was noted on the available photographs.

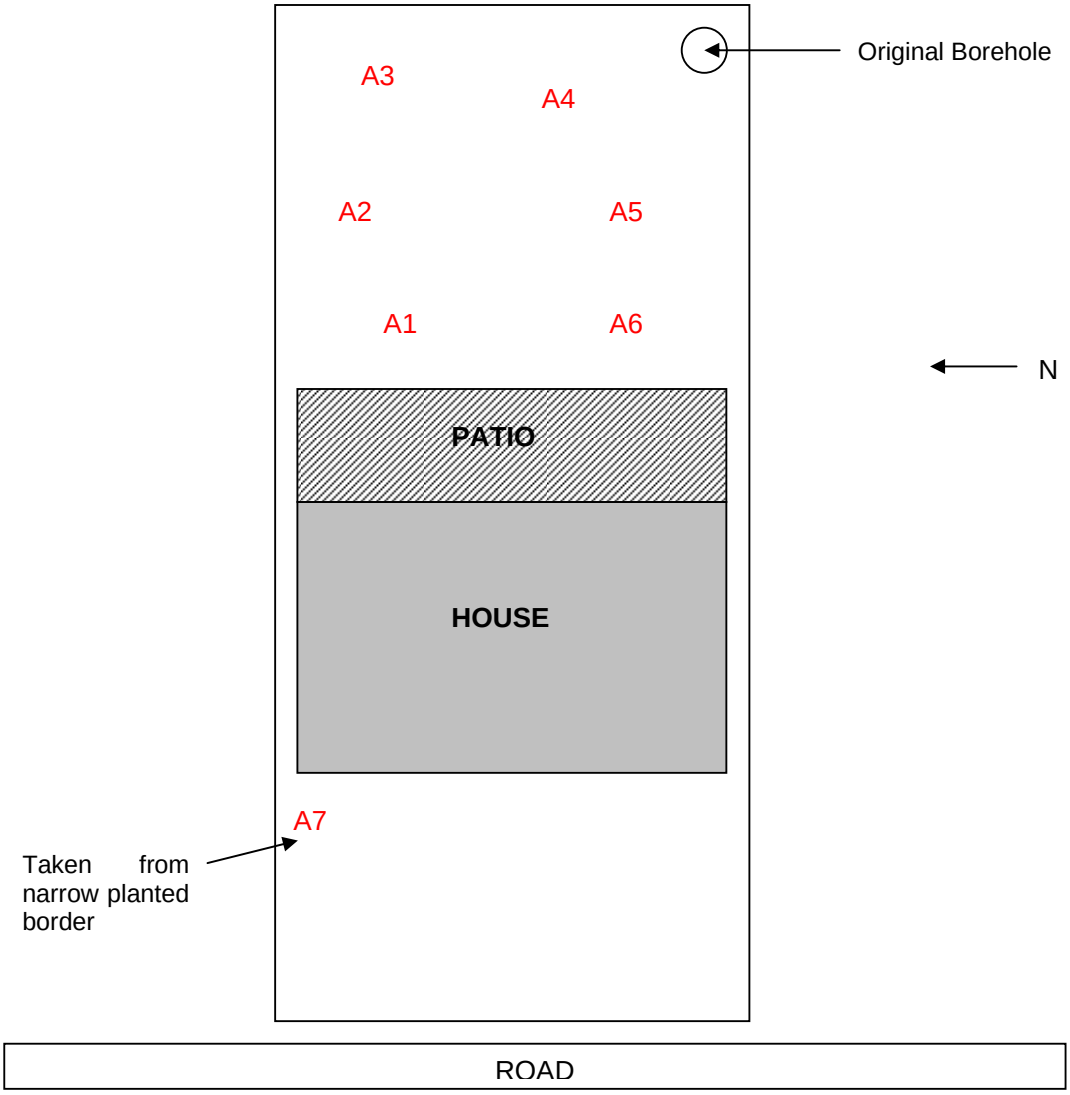
6.2 Methodology

Seven further soil samples were obtained from made ground at the property on 12th November. The samples were taken at a variety of depths, to characterise shallower made ground soils at the property. Six samples were taken from the (mostly grassed) rear garden, and a single sample from a narrow planted border in the front garden, the remainder of which is paved.

The samples were obtained by hand-digging under controlled conditions, including the use of disposable overalls and masks in accordance with Health and Safety Executive guidance document EM6 (asbestos essentials – PPE). The approximate sample locations are shown in Figure 6.1, overleaf.

The samples were dispatched to Alcontrol Laboratories for asbestos screen and identification analysis.

Figure 6.1 – Additional Asbestos Sampling Locations



6.3 Results

The results of the laboratory analysis are presented below:

Table 6.1 – Asbestos Analysis Results

Sample	Depth (m bgl)	Analysis Result
A1	0.3	No asbestos fibres detected
A2	0.1	No asbestos fibres detected
A3	0.5	No asbestos fibres detected
A4	0.1	No asbestos fibres detected
A5	0.5	No asbestos fibres detected
A6	0.3	No asbestos fibres detected
A7	0.1	No asbestos fibres detected

6.4 Conclusion

On the basis of the testing undertaken, asbestos fibres are not widespread within the made ground at the property. The residents of the prpoerty are unlikely to be exposed to an excessive asbestos fibre burden, compared to the typical lifetime exposures outlined in Appendix G. No further testing or action is proposed.

7 SAMPLING OF WATER AT RESIDENTS' TAPS

7.1 Introduction

One aspect of the investigation was to assess whether the concentrations of contaminants in the ground posed a potential risk to drinking water pipes. Certain contaminants can either attack the pipework or permeate through the pipe material.

Currently, the only available guidance on "safe" contaminant levels in regard to water pipes is held in Water Regulations Advisory Scheme (WRAS) report "The Selection of Materials for water Supply Pipes to be Laid in Contaminated Land", October 2002. An exceedance of the threshold levels published in the above document indicates that careful consideration of the materials used for water pipework is required.

The site investigation identified that the maximum concentrations of arsenic and petroleum hydrocarbons, and the maximum soil pH level recorded, exceed WRAS threshold values.

While South Staffordshire Water are able to confirm the materials used for water distribution pipework in the highway, the water company is not responsible for local connections to their mains, which were probably made at each property by the builder(s) of the houses at the site. As it would be problematic to excavate trial trenches across the site in an attempt to discover the materials used for water pipework (including local connection pipes laid by builders), it was agreed that sampling drinking water was the most appropriate means of evaluating whether unacceptable concentrations of contaminants were entering the drinking water supply.

Cannock Chase Council approached South Staffordshire Water to ask that the site is included in any regime of ongoing planned sampling of drinking water quality. Unfortunately, the water company is unable to accommodate such testing. It was therefore decided that samples of drinking water should be obtained as part of this investigation.

7.2 Methodology

Grontmij visited the site on 10th December 2010 to obtain samples from the kitchen taps of five properties at the site. Wherever possible, samples were taken from the properties where the highest contaminant concentrations had been recorded during the earlier soils investigation.

At each house, the tap was allowed to run for approx 30 seconds, and a sample taken. Samples were collected in phials, glass bottles and plastic bottles provided by the laboratory, Alcontrol Geochem. The samples were dispatched to the lab in chilled coolboxes under full chain of custody documentation. The samples were tested for dissolved metals and hydrocarbons, as these were the contaminants which were recorded in soil at concentrations in excess of the WRAS threshold values. The testing results were compared to guidelines in operation in the UK, comprising drinking water standards (Water Supply Water Quality Regulations 2000) and "Groundwater – Drinking Water Protected Areas" threshold values within the Water Framework Directive (WFD) Directions 2010. While the WFD Directions values are protective of groundwater rather than water at consumer's taps, the WFD values are in some cases more stringent than UK drinking water standards, hence both sets of standards have been used.

7.3 Results

A summary of the laboratory analysis results is presented in Table 7.1, along with details of corresponding UK Drinking Water Standards (DWS) and thresholds published in the Water Framework Directive Directions 2010. Full laboratory results are included in Appendix D.

Table 7.1 – Tap Samples – Chemical Analysis Results Summary

Contaminant	No of Samples Tested	Minimum Value	Maximum Value	UK Drinking Water Standard	WFD Groundwater*
Antimony	5	<0.16	0.53	5.0	No standard
Arsenic	5	0.48	0.80	10	7.5
Boron	5	59	71	1000	750
Cadmium	5	<0.10	0.18	5.0	3.75
Chromium	5	8.6	9.1	50	37.5
Copper	5	33	210	2000	1500
Lead	5	0.06	0.21	10	19
Nickel	5	1.2	2.0	20	15
Zinc	5	7.5	43	5000	3750
Mercury	5	<0.01	<0.01	1.0	0.75
Banded Hydrocarbons	5	<detection limit	<detection limit	10**	No standard

Results all expressed as ug/l, correct to two significant figures
* "Groundwater – Drinking Water Protected Areas" from Part 8 of the Water Framework Directive Directions 2010
** The drinking water standard of 10ug/l has been withdrawn, but in the absence of other guidance, we have assumed that 10ug/l would be adopted by regulators.

The above results indicate that the water quality at consumer's taps at the site is compliant with current legislation, and therefore contaminants in the soil do not appear to be adversely affecting the water pipes at the site.

No further assessment is considered necessary.

8 SUMMARY AND CONCLUSION

- Review of historical mapping and EA records provided to Cannock District Council identified that land off Brownhills Road and Walsall Road in Norton Canes, Staffordshire was infilled with unknown waste material which potentially posed a risk to human health and controlled waters.
- A detailed investigation identified that the concentration of benzo(a)pyrene in two made ground samples exceeded generic human health screening criteria.
- Additional testing and statistical analysis has demonstrated that the likely average benzo(a)pyrene concentration beneath the site does not exceed the generic screening value. Therefore, it is unlikely that the concentrations of contaminants beneath the site pose a risk to human health.
- Asbestos fibres were identified in one sample (of five analysed for asbestos). Asbestos-cement was not noted in any of the ten boreholes drilled, suggesting that asbestos fibres are not abundant in the made ground at the site.
- As a follow-up investigation, a further seven samples were taken from the property where asbestos fibres were detected. The seven additional samples did not obtain asbestos fibres, indicating that asbestos is not widespread at the sampled property, and no further action is proposed.
- It is unlikely that contaminants in the made ground will leach to the secondary aquifer beneath the site, in the Coal Measures, or migrate to the nearest surface watercourse, some 300m to the north-east, in concentrations considered to pose a risk to these receptors. The aquifer, in particular, is of lower sensitivity, as it is unlikely that water is abstracted from the aquifer for drinking water purposes.
- Concentrations of arsenic and petroleum hydrocarbons and the soil pH within made ground exceed the generic screening criteria for contaminant permeation into water pipework adopted by water companies. Follow-up testing of water from consumers' taps indicates that the concentrations of contaminants within drinking water is very low, and is unlikely to affect human health. No further assessment is proposed.
- Gas monitoring has identified that the concentrations and flow rates of hazardous gases beneath the site are unlikely to pose a human health or explosion risk to the housing at the site. No further assessment in regard to gas is necessary.

On the basis of the preceding assessment and the limitations listed in Appendix B, we consider that the site is suitable for its current use, and should not be declared contaminated land under Part 2A of the Environmental Protection Act 1990.

DRAWINGS
(omitted for
confidentiality
reasons)

APPENDIX A

Cannock Chase District Council

Environmental Protection Act 1990, Part IIa: Initial Desktop Study and Walkover

Land Between Brownhills Rd and Walsall Rd, Norton Canes, Staffordshire

January 2010

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Document Control

Report Reference	Issue Date	Reason for Issue		Prepared by	Checked by	Approved by
R386/P102974/V1/2010	19/1/10	First Issue	Name	Erika Warnatzsch	Lewis Barlow	Bryn Thomas
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1 INTRODUCTION

1.1 Terms of Reference

In January 2010, Grontmij Limited (Grontmij) was appointed by Cannock Chase District Council (the Council) to assist in the implementation of the Council's Contaminated Land inspection strategy. Part IIa of the Environmental Protection Act 1990 (Part IIa) requires each local authority to inspect areas of land which it believes may be Part IIa Contaminated Land.

The scope of work agreed between Grontmij and the Council included:

- Prioritisation of an initial list of potentially contaminated sites for intrusive investigation work, based upon the sensitivity of each site, using existing limited desktop study data provided by the Council, and
- Production of Desktop Study reports for priority sites, to improve the understanding of the sites and inform the planning of intrusive site investigations.

This report presents the findings of an initial study of a suspected former landfill site located between Brownhills Rd and Walsall Rd, Norton Canes, Staffordshire. The site comprises an area of land which appears to have been infilled with waste material, forming part of a wider site potentially subject to infilling. The site was considered to be sensitive as 95 residential properties with gardens overly the inferred extent of landfill, and the site is underlain by a minor aquifer.

This report is subject to the limitations presented in Appendix B.

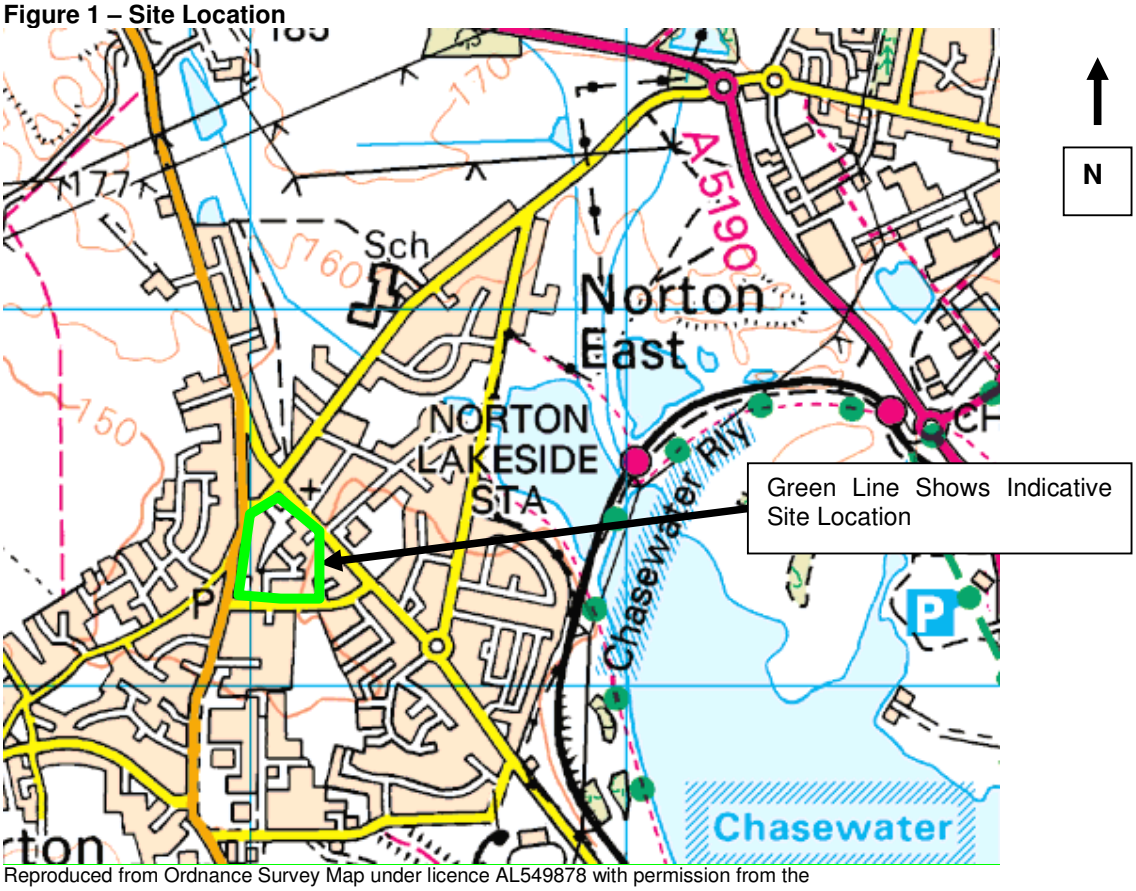
2 SITE SETTING

The site's setting and location are summarised in Table 2.1 and Figure 2.1.

Table 1 – Site Setting

Data	Information
Address	Land between Brownhills Rd and Walsall Rd, Norton Canes, Staffordshire, WS11 9TD
Current site use:	Residential houses and gardens.
Grid Reference:	Located around 402067, 308359.
Site Area:	Approximately 1.5 ha.
Topography:	Slopes generally towards west.
Surrounding land use	North: residential area with small scale commercial premises and a doctors surgery East: predominantly residential, with school and playing fields South: commercial centre and open land West: residential and open land
Geology	British Geological Survey (BGS) information indicates that the site is underlain by Boulder clay over Middle Coal Measures The likely thickness of deposits is not stated.
Hydrogeology	The coal measures are regarded as a minor aquifer by the Environment Agency.
Source Protection Zones (SPZs)	The Environment Agency website indicates that the site does not lie within a SPZ.
Surface Waters	A stream is located 300m northeast of the Study Site, Chasewater (a large lake) 500m to the east of the Study Site and a further stream is located 500m to the west of the Study Site.
Historical Land Use	The Study Site formerly made up part of the Conduit Colliery. Conduit Colliery Company had several collieries in the Norton Canes/Brownhills area. The colliery sinking began in 1858 and the last shaft was closed in 1962. The information provided indicates that after closure of the colliery the site was operated and infilled as a landfill. The site was subsequently redeveloped for residential and small-scale commercial purposes. There is no information about the site's license, operational period or the date the site was developed on Environment Agency "What's In Your Back Yard" website.
National Nature Reserves (NNRs)	No local nature reserves are located on or within 250m of the Study Site.
Ramsar Sites	No Ramsar Sites are present on or within a 250m radius of the Study Site.
Sites of Special Scientific Interest (SSSI)	No SSSIs are present on or within a 250m radius of the Study Site.
SSSI Unit	No SSSI Units are present on or within a 250m radius of the Study Site.
Special Protection Areas	No SPAs are present on or within a 250m radius of the Study Site.
Special Areas of Conservation	No SACs are present on or within a 250m radius of the Study Site.

Figure 1 – Site Location



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Plan is not to scale.

3 SUMMARY OF AVAILABLE SITE INSPECTION AND INVESTIGATION DATA

The study site forms part of a wider site which the Environment Agency has identified as a former landfill site. The wider landfilled site is indicated by blue shading on Drawing 1.

No previous site investigation data is held by the council. However, as part of a post-1994 planning application for a site entitled “adjacent to 58 Brownhills Rd”, located immediately north of the study site, the council received a copy of a letter sent from the Environment Agency to the developer. The letter indicates that the “adjacent to 58 Brownhills Road” development is underlain by landfill (thought to be colliery spoil, infilled by 1973) and is located within 15m of another landfill, located to the west (thought to be infilled with household waste between 1963-75). On this basis, it is likely that the study site is also underlain by landfilled material. The Environment Agency letter recommended extensive investigation of the development site, to include gas monitoring, and recommended ongoing monitoring post-development, however the council does not hold any records to confirm such work took place.

A copy of the Environment Agency letter referenced above is included as Appendix A. The location of the “adjacent to 58 Brownhills Road” site is shown on Drawing 1.

The council is also aware that remediation work was carried out prior to the development of land to the south of the study site, indicating that contaminants and/or ground gases posed a potential problem to residential housing. Unfortunately, no documentation is available to confirm the contaminants and/or gases identified, or the scope of remediation work undertaken.

The site has been subject of a preliminary walkover by the council. No obvious evidence of contamination was identified during the inspection, carried out from the public highway. Of course, as the site has been developed, this is not a surprising observation.

4 PRELIMINARY CONCEPTUAL MODEL

4.1 Introduction

This section of the report presents a preliminary contaminated land assessment, on the basis of the available desktop data. The assessment presents an evaluation of the potential risks posed, should contaminants be present in the soil or groundwater beneath the site.

In the context of the Environmental Protection Act 1990 (EPA90), the Water Act 2003 and associated guidance[1,2], a preliminary (contaminated land) risk assessment should focus on whether the land at a subject site meets the statutory definition of Contaminated Land. Part IIA of the EPA90, as amended by the Water Act 2003, defines Contaminated Land as:

- *"any land which appears to the local authority in whose area it is situated to be in such condition by reason of substances in, on or under the land, that:*
- *significant harm is being caused or there is a significant possibility of significant harm being caused; or*
- *significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused*

The procedure for assessing contaminated land involves the development of a Conceptual Site Model (CSM) comprising the assessment of potential Contaminants, Pathways and Receptors.

4.1.1 Sources of Contaminants

The "contaminants" term in the conceptual model has been evaluated by inspection of existing desktop study data provided by Cannock Chase District Council, and a preliminary site walkover. The following potential sources of contaminants have been identified:

- An infilled area of land, which could contain contaminants including (but not limited to) metals, hydrocarbons, polyaromatic hydrocarbons (PAHs), volatile and semi-volatile organic compounds (VOCs and SVOCs).
- Methane and carbon dioxide gas, from the decomposition of biodegradable landfilled material beneath the site.

4.1.2 Receptors

DEFRA Circular 02/2006 defines a Receptor as:

- *"either (a) a living organism, a group of organisms, an ecological system or a piece of property which (i) is in a category listed in Table A as a type of receptor, and (ii) is being, or could be, harmed, by a contaminant; or (b) controlled waters which are being, or could be, polluted by a contaminant".*

Table 2 lists all of the receptors to be considered by a Part IIA or PPS23[3] assessment, and assesses whether the receptors are likely to be present at the site.

[1] CLR11 Model Procedures for the Management of Land Contamination (EA & DEFRA September 2004)
[2] DEFRA Circular 02/2006, Environmental Protection Act 1990: Part IIA Contaminated Land:, September 2006.
[3] Planning Policy Statement (PPS) 23: Planning and Pollution Control, Annex 2: Development on Land Affected by Contamination

Table 2 - Potential Receptors

Receptor Type	Receptors	Present (✓ /✖)	Notes
Humans	On-site residents	✓	Residential properties (houses and gardens) above indicative extent of landfill. Assumed to have vegetable patches.
	Construction staff and SI personnel.	X	No known redevelopment proposed
	Future occupants of the site	✓	(level of risk same as current residents so not considered further)
	Off site commercial workers or residents	✓	Possibly exposed to gases migrating off-site through permeable strata
Ecosystems	Any designated ecological system[4], or living organism forming part of such a system	X	Inspection of MAGIC website has identified that the site does not lie within, or within 250m of, an ecologically designated site.
Property (Flora and Fauna)	Crops, including timber	X	Not present
	Produce grown domestically, or on allotments for consumption	✓	Vegetables grown in residential gardens.
	Livestock	X	Not present
	Other owned or domesticated animals	✓	Pets in residential properties.
	Wild animals which are the subject of shooting or fishing rights	X	Not present
Property (Buildings & Structures)	A 'building' means any structure, including any part below ground level, but does not include plant or machinery within a building.	✓	Residential houses above indicative extent of landfill.
Controlled Waters[1]	Territorial waters	✖	None feasibly close enough to be impacted.
	Coastal waters	✖	None feasibly close enough to be impacted.
	Inland Freshwaters	✓	An unnamed stream is present 300m to northeast of the site and Chasewater, a large lake, is present 500m east of the site. A further stream is present 500m to west of site.
	Groundwater	✓	Minor aquifer beneath site.

[1] as defined in the Water Resources Act Section 104. Generally includes most surface water bodies excluding drains which discharge into sewers.

[4] Includes sites designated as SSSI or National Nature Reserve by the Wildlife and Countryside Act 1981, Special Area of Conservation (including candidate sites), Special Protection Area or Ramsar Site by the Conservation (Natural Habitats etc) Regulations 1994, and Local Nature Reserve by the National Parks and Access to the Countryside Act 1949.

4.1.3 Pathways

DEFRA Circular 02/2006 defines a Pathway as:

- *"one or more routes or means by, or through, which a receptor: (a) is being exposed to, or affected by, a contaminant; or (b) could be exposed or affected"*

Pathways are examined as part of Table 3, overleaf.

4.1.4 Potential Pollutant Linkages

The pollutant linkages identified are also presented in Table 3.

Table 3 - Potential Pollutant Linkages

No.	Receptor	Contaminant(s)	Pathway(s)	Risk of Pollutant Linkage Being Realised	Comments
Human Health					
1	Residents of properties above infilled ground – including children playing in gardens & vegetable consumption	Contaminants including (but not limited to) metals, hydrocarbons, PAHs, VOCs, SVOCs within the made ground.	Direct ingestion/dermal contact/inhalation of dust/inhalation of vapours/consumption of home-grown vegetables	Medium to High	Grass and/or topsoil coverage likely to mitigate risk to an extent – risk is greatest where possibly impacted soils are exposed or could be encountered, for example, when digging a vegetable patch or when children play outdoors. Properties are constructed directly above a potentially significant contamination source.
2		Methane and carbon dioxide from decomposition of deleterious elements of the made ground.	Movement into buildings, subsequent asphyxiation and explosion risk.	Medium to High	Investigation and monitoring required to determine risk.
Property					
3	Subsurface services serving the buildings (principally water supply)	Contaminants including metals, hydrocarbons, PAHs, VOC, SVOCs within the made ground.	Chemical attack and tainting of water supply could occur at high contaminant concentrations / severe pH levels	Medium	Risk will depend on depth and concentration of contaminants and material(s) used for water pipes.
4	Property (Structures) – sub-surface concrete	Sulphate and pH	Contact between contaminants and concrete.	Medium	Possible risk but could only reasonably be established if concrete class used to construct buildings can be established (unlikely) – more relevant for any new planned buildings.
Controlled Waters					
5	Minor aquifer beneath site	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Leaching of chemicals to aquifers	Medium	Risk will depend upon depth and concentration of contaminants, presence/absence of confining layers between contaminants and the aquifers, leaching potential etc. Site data needed.

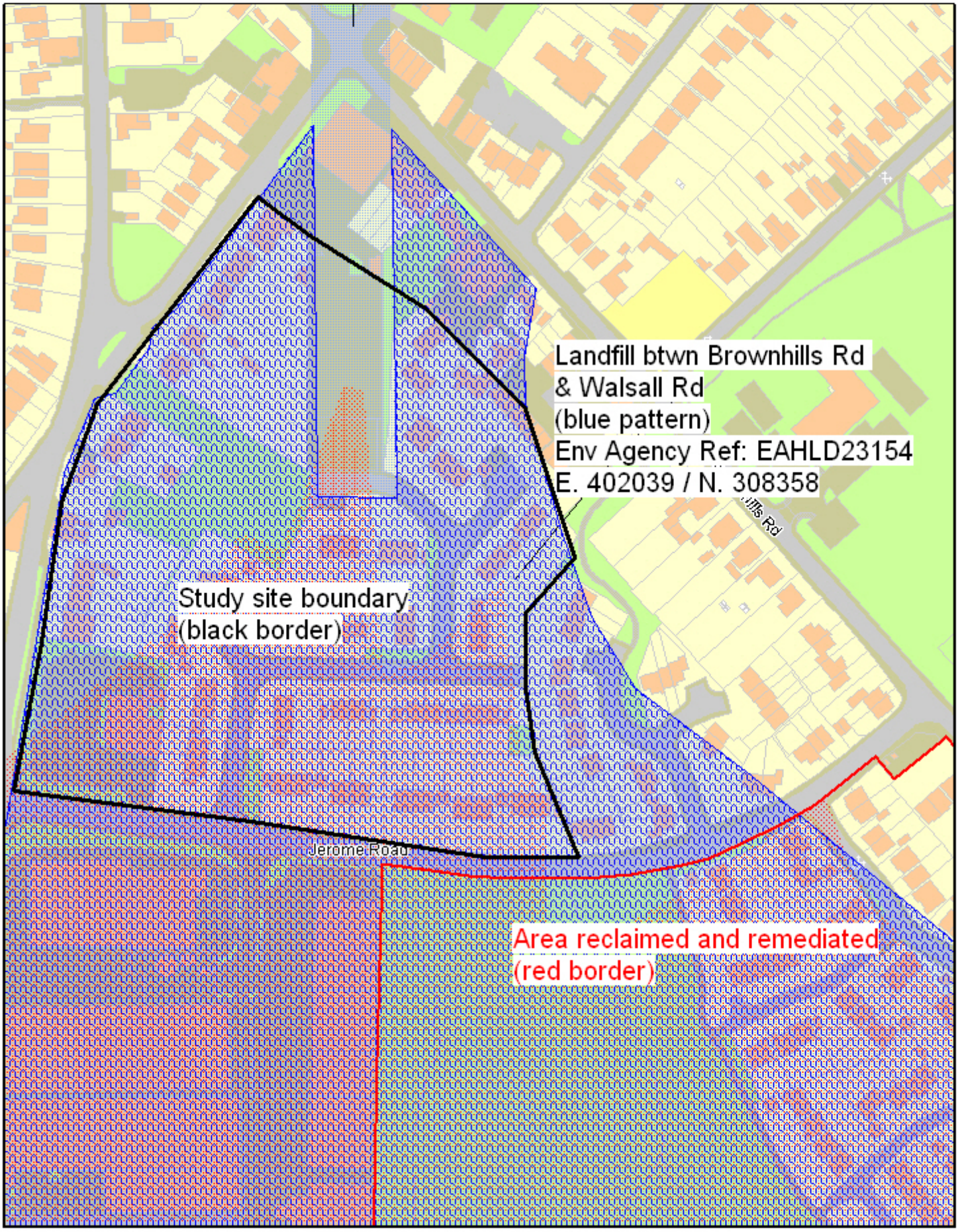
No.	Receptor	Contaminant(s)	Pathway(s)	Risk of Pollutant Linkage Being Realised	Comments
6	Surface waters (closest wasters: a stream 300m northeast, Chasewater (large lake) 500m to east and a further stream 500m west of the study site)	Contaminants including metals, hydrocarbons, PAHs, VOCs and SVOCs within the made ground.	Groundwater flow in permeable strata which are in continuity with watercourses	Low to Medium	Risk depends on depth/presence of contaminated groundwater, hydraulic gradient within any impacted groundwater unit, and continuity between impacted groundwater and watercourse. .

5 CLOSING REMARKS

Potential pollutant linkages affecting the health of on-site residents and controlled waters have been identified, and therefore an initial intrusive investigation should be carried out to examine the likelihood of significant pollutant linkages existing at the site.

DRAWINGS

Cannock Chase Council	Drawing 1:	Proposed Investigation Site Between Walsall Rd & Brownhills Rd., Norton Canes	N W E S
	NOT TO SCALE	DATE	



APPENDIX A

Our ref: UT\2001\005623\001
Your ref: CH/01/0392

ENVIRONMENT AGENCY

Date: 2nd July 2001

J W Heminsley
Planning & Building Control Manager
Cannock Chase Council
Civic Centre,
P O Box 28,
Beecroft Rd
Cannock
Staffordshire
WS11 1BG

Dear Sir/Madam

RESIDENTIAL DEVELOPMENT OF FOUR TERRACED HOUSES LAND ADJACENT TO 58 BROWNHILLS ROAD, NORTON CANES

Thank you for referring the above application which was received on 25 June 2001.

According to our records there are TWO landfill sites within 250 metres of the proposed development.

Landfill site reference CC08 lies beneath the proposed development. This site was filled prior to licensing with what is believed to have been colliery spoil around 1973.

Landfill site reference CC09 lies 15 metres to the west of the proposed development. This site was filled prior to licensing with what is believed to have been household waste between 1963 and 1975.

Unfortunately the Environment Agency holds no information with regards to environmental monitoring of these sites.

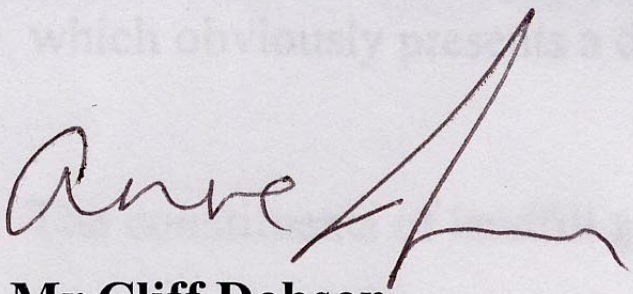
Waste Management Paper No. 27 "Landfill Gas" recommends that no house, garden shed, greenhouse or any domestic extension should be constructed within 50 metres of any landfill site which:
a) has landfill gas concentrations at or above 1% by volume flammable gas, and 1.5% by volume carbon dioxide, or
b) still has the potential to produce large quantities of landfill gas.

In view of the above information, we recommend that the land subject to this consultation is subject to an extensive site investigation BEFORE the application is determined. The site investigation should have regard to the advice contained in: Waste management Paper N? 27; DD175 - 1988 entitled "Draft for Development - Code of Practice for the Identification of Potentially Contaminated Land and its Investigations;" British Standard 5930 - Site Investigations; and other relevant guidance, such as the CIRIA papers.

If planning permission is granted, then given the above, we recommend the installation of permanent gas monitoring points to identify any risks posed prior to, during, and after the development is complete. We also recommend that the building is designed and constructed to prevent the entry of any migrating gas in accordance with the Building Research Establishment's publication entitled "The construction of new buildings on gas contaminated land". All design and construction should be agreed with the Local Authority's Building Inspectors. Subsequent occupiers / owners of the buildings should be made aware of the need for any gas readings to be continually assessed.

The information relating to landfill sites has been compiled from records and files from various sources and of varying degrees of reliability. The Agency is not able to offer any warranty as to the accuracy or completeness of the information provided, nor can it accept any liability in respect thereof.

Yours faithfully



Mr Cliff Dobson
Customer Services Manager

Please ask for: Anne Jordan

APPENDIX B

Appendix B: Limitations Statement

1. This report has been prepared for the exclusive use of Cannock Chase District Council and copyright subsists with Grontmij Limited. Prior written permission must be obtained to reproduce all or part of the report.

2. This report and/or opinions have been prepared for the specific purpose stated in the document. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Grontmij Limited.

3. Observations were made of the site and of structures on the site as indicated within the report.

4. This report targets a parcel of land previously identified as potentially contaminated land by the Cannock Chase District Council, and does not seek to render an opinion on the quality of land outside the study area.

5. Grontmij has relied upon the existing data provided by Cannock Chase District Council to be accurate, and has not taken steps to independently check the accuracy of the data provided.

6. Our interpretation of any regulatory database information (including the MAGIC and British Geological Survey websites) assumes that the data provided is accurate. A disclaimer provided by database search companies is as follows: '…the data is derived from historical sources or information available in public records or from third parties and is supplied to us without warranty by data suppliers and we cannot warrant the accuracy or completeness of the data or the reports.' We cannot therefore accept any responsibility for the accuracy of the data used in this study, only that its interpretation has been carried out with due skill, care and diligence.

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2. This report and/or opinions have been prepared for the specific purpose stated in the document. The recommendations should not be used for other purposes or adjacent sites without further reference to Grontmij Limited.

3. Observations were made of the site and soil arisings as indicated within the report. Where access to portions of the site was unavailable or limited, Grontmij Limited renders no opinion as to the environmental status of such parts of the site.

4. Grontmij has relied upon the existing desktop study data provided by Cannock Chase District Council to be accurate, and has not taken steps to independently check the accuracy of the data provided.

5. Our interpretation of any regulatory database information (including the MAGIC and British Geological Survey websites) within an earlier report, and relied upon in this report, assumes that the data provided is accurate. A disclaimer provided by database search companies is as follows: ' the data is derived from historical sources or information available in public records or from third parties and is supplied to us without warranty by data suppliers and we cannot warrant the accuracy or completeness of the data or the reports.' We cannot therefore accept any responsibility for the accuracy of the data used in this study, only that its interpretation has been carried out with due skill, care and diligence.

6. The conclusions and recommendations submitted in this report are based in part upon the data obtained from soil samples from exploratory holes. The nature and extent of variations between the exploratory holes is inferred in the report and could only be confirmed by further investigation. If variations or other latent conditions become evident, it will be necessary to re-evaluate the recommendations of this report.

7. The generalised soil profile described in the text is intended to convey trends in sub-surface conditions. The boundaries between strata are approximate and idealised and have been developed in interpretations of widely spaced explorations and samples; actual soil transitions may be more gradual. For specific information, refer to the exploration logs.

8. Water levels and/or gas readings have been taken in the borings and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater or gas may occur due to variations in rainfall, atmospheric pressure and other factors different from those prevailing at the time the measurements were made.

9. The conclusions and recommendations of this report are based in part upon various types of chemical analysis of soil, water or gases, and are contingent upon their validity. These data have been reviewed and interpretations made in the report. Variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors. Should additional analytical or monitoring data

become available in the future, these data should be reviewed and conclusions and recommendations presented herein modified accordingly.

10. Chemical analyses have been performed for specific parameters during the course of this study, as detailed in the text. It must be noted that additional constituents not searched for during the current study may be present in soil, groundwater and soil voids at the site.

APPENDIX C

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No
WSA

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	07-07-10 07-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					0.30	MADE GROUND: (Turf over) Brown clayey very gravelly fine grained SAND with occasional roots and rootlets. Gravel is fine to medium sub rounded quartz and occasional brick. (Topsoil).	
0.30-0.30	ES					(0.70)	MADE GROUND: Brown clayey very sandy GRAVEL with many COBBLES. Gravel is fine to coarse angular to sub angular brick, ceramic, burnt shale, ash, quartz, slag and coal. Cobbles are brick, diorite and ceramic.	
0.60-0.60	ES					1.00		
1.00-1.00	ES					(0.90)	MADE GROUND: Firm dark brown and black slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to sub rounded ash, brick, burnt shale and quartz.	
						1.90		
						(1.60)	MADE GROUND: Black clayey very sandy GRAVEL. Gravel is fine to medium angular ash, burnt shale and slag. Sand is angular ash.	
						3.50		
3.50-3.50	ES					(1.00)	Firm orange brown and light grey sandy slightly gravelly CLAY with occasional reddish brown silty coarse grained sand bands. Gravel is medium sub rounded to rounded quartz. (Glacial Till)	
						4.50		
						(0.50)	Orange brown very silty coarse grained SAND and GRAVEL. Gravel is medium to coarse sub rounded to well rounded quartz. (Glacial Fluvial Deposits)	
						5.00	End of Hole at 5m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Public grassed area. No groundwater strike	**5m bgl**
None Encountered				

Contractor	Method/ Plant Used	
Sherwood Drilling	Tracked window sample rig	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No: **WSB**

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	08-07-10 08-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10 0.30-0.30	ES ES					(0.53) 0.53	MADE GROUND: Brown very clayey very gravelly fine to coarse grained SAND. Gravel is fine to coarse sub angular to sub rounded quartz, brick, weathered coarse grained sandstone and occasional plastic.	
0.60-0.60	ES					(0.47) 1.00	MADE GROUND: Orange brown very clayey very gravelly coarse grained SAND. Gravel is angular to sub rounded quartz and brick.	
1.00-1.00	ES					(1.20) 2.20	Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse sub rounded to well rounded quartz. (Glacial Till)	
						(0.50) 2.70	Reddish brown very silty gravelly coarse grained SAND. Gravel is fine to coarse rounded to well rounded quartz. (Glacial Fluvial Deposits)	
						3.00	Reddish brown and orange brown very silty coarse grained SAND and GRAVEL. Gravel is medium to coarse rounded to well rounded quartz. (Glacial Fluvial Deposits)	
							End of Hole at 3m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in gravel patio area. No groundwater strike	**3m bgl**
None Encountered				

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No: **WSC**

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	08-07-10 08-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES						MADE GROUND: Dark grey clayey very gravelly fine to coarse grained SAND. Gravel is fine to coarse sub angular to sub rounded ash, coal, clinker, brick and quartz.	
0.30-0.30	ES							
0.60-0.60	ES					(1.16)		
						1.16		
1.10-1.10	ES						Very stiff light grey sandy slightly gravelly CLAY. Gravel is sub rounded to well rounded quartz. (Glacial Till)	
1.20-1.20	ES					1.50		
							End of Hole at 1.5m bgl.	

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in flower bed. No groundwater strike	**1.5m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50 Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

WINDOW SAMPLE No: **WSD**

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	08-07-10 08-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					(0.89) 0.89	MADE GROUND: (Turf over) Brown clayey very gravelly fine grained SAND with occasional roots and rootlets. Gravel is fine to medium sub rounded quartz, brick and occasional ash.	
0.30-0.30	ES							
0.60-0.60	ES							
1.00-1.00	ES					(0.53) 1.42	Firm reddish brown sandy slightly gravelly CLAY. Gravel is fine to coarse sub rounded to well rounded quartz. (Glacial Till)	
						1.76	Very stiff light grey and orange brown slightly sandy slightly gravelly CLAY. Gravel is sub rounded to rounded quartz. (Glacial Till)	
						2.00	Orange brown very silty coarse grained SAND and GRAVEL. Gravel is coarse sub rounded to well rounded quartz. (Glacial Fluvial Deposits)	
						2.23	Firm orange brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse rounded to well rounded quartz. (Glacial Till)	
						(0.58) 2.81	Soft to firm dark brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse rounded to well rounded quartz. (Glacial Till)	
						3.00	Orange brown silty coarse grained SAND and GRAVEL. Gravel is medium to coarse rounded quartz. (Glacial Fluvial Deposits)	
							End of Hole at 3m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in lawn. No groundwater strike	**3m bgl**
None Encountered				

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No: **WSE**

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	PSW

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	09-07-10 09-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES						MADE GROUND: Turf over dark grey brown silty slightly gravelly ashy sand. Gravel is angular to subrounded fine to coarse of various lithologies. Occasional fragments of glass. 0 - 0.30m frequent rootlets.	
0.30-0.30	ES					(0.90)		
0.60-0.60	ES					0.90		
1.00-1.00	ES					1.00	Red-brown SAND and GRAVEL. Gravel is subrounded fine to coarse of various lithologies (Possibly reworked natural?)	
						(0.50)	Firm red-brown slightly gravelly CLAY. Gravel is subrounded fine to coarse of various lithologies. Occasional fragments of coal. (Possibly reworked natural?)	
						1.50	End of Hole at 1.5m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in lawn 1.50m: Refusal - Probable cobble. No groundwater strike	**1.5m bgl**
None Encountered				

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No: **WSF**

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	PSW

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	09-07-10 09-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10 0.30-0.30	ES ES					(0.60) 0.60	MADE GROUND: Turf over dark grey brown silty slightly gravelly ashy sand. Gravel is angular to subrounded fine to coarse of various lithologies. Occasional fragments of glass. 0 - 0.30m frequent rootlets.	
0.60-0.60 1.50-1.50	ES ES					(1.10) 1.70	Firm red-brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of various lithologies. Occasional fragments of coal. (Possibly reworked natural?)	
						2.00	Soft red-brown sandy CLAY.	
							End of Hole at 2m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in lawn 2.00m: Refusal - Probable cobble. No groundwater strike	**2m bgl**
		None Encountered		

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No
WSG

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	PSW

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	09-07-10 09-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					0.10	MADE GROUND: Grey subrounded medium gravel (Decorative chippings)	
0.30-0.30	ES					0.20		
						0.50	MADE GROUND: Brown organic slightly sandy silt (Decorative bark chippings)	
0.60-0.60	ES					(0.75)	MADE GROUND: Dark grey silty slightly gravelly ashy sand. Gravel is subrounded fine to medium of various lithologies. Occasional fragments of coal.	
1.00-1.00	ES					1.25	Red-brown SAND and GRAVEL. Gravel is subrounded fine to coarse of various lithologies, predominantly quartz. Occasional cobbles. (Possibly reworked natural?)	
							End of Hole at 1.25m bgl.	

Groundwater	General Remarks	Final Depth
Strike Depth: (m) Rising to: (m) Groundwater Remarks None Encountered	Location: Back garden in gravel path 1.25m: Refusal - Probable cobble. No groundwater strike	**1.25m bgl**

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50 Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No
WSH

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	12-07-10 12-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					0.20	MADE GROUND: Brown very clayey gravelly fine to coarse grained SAND with occasional roots and rootlets. Gravel is fine to medium sub rounded to rounded quartz and occasional brick. (Topsoil)	
0.30-0.30	ES						MADE GROUND: Dark grey very clayey coarse grained SAND and GRAVEL. Gravel is fine to coarse sub angular to rounded ash, brick, ceramic, quartz and slag. Sand is angular ash.	
0.60-0.60	ES							
1.00-1.00	ES					(2.32)		
						2.52		
						(0.48)	Orange brown silty coarse grained SAND and GRAVEL. Gravel is medium to coarse sub rounded to well rounded quartz. (Glacial Fluvial Deposits)	
						3.00	End of Hole at 3m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in lawn. No groundwater strike	**3m bgl**
None Encountered				

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No
WSJ

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	08-07-10 08-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					0.29	MADE GROUND: (Turf over) Brown very clayey gravelly fine to coarse grained SAND with occasional roots and rootlets. Gravel is fine rounded quartz. (Topsoil)	
0.30-0.30	ES						Light brown clayey coarse grained SAND and GRAVEL. Gravel is fine sub angular to well rounded quartz. (Glacial Fluvial Deposits)	
0.60-0.60	ES					(1.61)		
						1.90	End of Hole at 1.9m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Back garden in lawn. No groundwater strike	**1.9m bgl**
		None Encountered		

Contractor	Method/ Plant Used	
Sherwood Drilling	Hand held window sampling	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

WINDOW SAMPLE LOG

Grontmij

WINDOW SAMPLE No: **WSK**

Project	Client	Logged By
Brownhills Rd & Walsall Rd	Cannock Chase DC	MJH

Job No	Date	Ground Level (m)	Co-ordinates	Checked By
103912	12-07-10 12-07-10			

SAMPLES & TESTS			Water	STRATA				Instrument / Backfill
Depth	Type	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
0.10-0.10	ES					(1.48) 1.48	MADE GROUND: Brown very clayey very gravelly fine to coarse grained SAND with occasional cobbles. Gravel is fine to coarse angular to sub rounded brick, concrete, quartz, ash, coal and burnt shale. Cobbles are angular brick.	
0.30-0.30	ES							
0.60-0.60	ES							
1.00-1.00	ES							
1.50-1.50	ES					(0.91) 2.39	Firm reddish brown and light grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse rounded to well rounded quartz. (Glacial Till)	
						2.59	Reddish brown very silty gravelly coarse grained SAND. Gravel is medium to coarse rounded to well rounded quartz. (Glacial Fluvial Deposits)	
						(1.31) 3.90	Stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is medium to coarse rounded to well rounded quartz. (Glacial Till)	
						(1.10) 5.00	Light brown very silty very sandy GRAVEL. Gravel is fine to coarse sub rounded to well rounded quartz. (Glacial Fluvial Deposits)	
							End of Hole at 5m bgl.	

Groundwater			General Remarks	Final Depth
Strike Depth: (m)	Rising to: (m)	Groundwater Remarks	Location: Public grassed area. No groundwater strike	**5m bgl**
		None Encountered		

Contractor	Method/ Plant Used	
Sherwood Drilling	Tracked window sample rig	All dimensions in metres Scale 1:50

Sheet 1 of 1

GRONTMIJ WINDOW SAMPLE LOG 2006 BROWNHILLS.GPJ AGS3_ALL.GDT 19/10/10

APPENDIX D

ALcontrol Laboratories

			Customer Sample ID		WSA	WSA	WSA	WSC	WSC	WSD	WSD	WSE	WSE	WSF	WSF	WSG	WSH	WSH	WSH	WSK	WSK
			Depth		0.10-0.00	0.30-0.00	3.50-0.00	0.10-0.00	0.60-0.00	0.10-0.00	0.30-0.00	0.10-0.00	0.30-0.00	0.30-0.00	0.60-0.00	0.30-0.00	0.10-0.00	0.60-0.00	1.00-0.00	0.10-0.00	0.30-0.00
Case:	98,100715-104,100715-76,100716-5,100715-83		AGS Id		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Customer:	Grontmij Solihull (5731)		Sample Type		SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Customer ref:	CANNOCK PORT 2A		Sampled Date		07/07/2010	07/07/2010	07/07/2010	08/07/2010	08/07/2010	08/07/2010	08/07/2010	09/07/2010	09/07/2010	09/07/2010	09/07/2010	09/07/2010	12/07/2010	12/07/2010	12/07/2010	12/07/2010	12/07/2010
Order no:	,146072		Sample Received Date		09/07/2010	09/07/2010	09/07/2010	15/07/2010	15/07/2010	15/07/2010	15/07/2010	16/07/2010	16/07/2010	16/07/2010	16/07/2010	16/07/2010	15/07/2010	15/07/2010	15/07/2010	15/07/2010	15/07/2010
			Final Instruction Date		26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010	26/07/2010
All results expressed on a dry weight basis			Report Completed Date		04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010	05/08/2010	05/08/2010	04/08/2010	04/08/2010	04/08/2010	04/08/2010
			Project		100709-53	100709-53	100709-53	100715-83	100715-83	100715-83	100715-83	100716-5	100716-5	100716-5	100716-5	100716-5	100715-104	100715-104	100715-104	100715-104	100715-104
			Lab Sample Number		1799472	1799466	1799405	1825942	1825766	1825486	1825814	1827769	1827597	1827801	1827538	1827820	1826975	1826942	1827059	1826897	1826862
			Sample Temperature																		
Analysis	Test	Method	Units	LOD																	
Sample Description																					
	Colour	PM024	-		Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	-	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown	Dark Brown
	Grain Size	PM024	-		0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	-	0.1 - 2 mm	0.1 - 2 mm	0.1 - 2 mm	0.063 - 0.1 mm	0.1 - 2 mm	0.063 - 0.1 mm	0.1 - 2 mm	0.1 - 2 mm
	Description	PM024	-		Sand	Loamy Sand	Sandy Clay	Sand	Sand	Sand	Loamy Sand	Sand	-	Sandy Loam	Sandy Loam	Sandy Loam	Silty Clay	Sand	Silty Clay	Sand	Sand
	Inclusions	PM024	-		Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones	-	Stones	Stones	Stones	N/A	Stones	N/A	Stones	Stones
	Moisture	PM114	%		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Moisture content ratio	PM114	%		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Dry matter content ratio	PM114	%		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Asbestos																					
	Asbestos Containing Material Screen	TM001	-		-	No ACM Detected	-	-	-	-	-	-	Possible ACM Detected	-	No ACM Detected	No ACM Detected	-	-	-	-	No ACM Detected
	Date of Analysis	TM048	-		-	-	-	-	-	-	-	-	28/07/2010	-	-	-	-	-	-	-	-
	Analysed by	TM048	-		-	-	-	-	-	-	-	-	Kevin Bowron	-	-	-	-	-	-	-	-
	Comments	TM048	-		-	-	-	-	-	-	-	-	Typical of asbestos cement	-	-	-	-	-	-	-	-
	Asbestos, Chrysotile (white)	TM048	-		-	-	-	-	-	-	-	-	Detected	-	-	-	-	-	-	-	-
	Asbestos, Amosite (brown)	TM048	-		-	-	-	-	-	-	-	-	Not Detected	-	-	-	-	-	-	-	-
	Asbestos, Crocidolite (blue)	TM048	-		-	-	-	-	-	-	-	-	Not Detected	-	-	-	-	-	-	-	-
	Anthophyllite, Fibrous	TM048	-		-	-	-	-	-	-	-	-	Not Detected	-	-	-	-	-	-	-	-
	Tremolite, Fibrous	TM048	-		-	-	-	-	-	-	-	-	Not Detected	-	-	-	-	-	-	-	-
	Actinolite, Fibrous	TM048	-		-	-	-	-	-	-	-	-	Not Detected	-	-	-	-	-	-	-	-
	Non-asbestos fibre	TM048	-		-	-	-	-	-	-	-	-	Not Detected	-	-	-	-	-	-	-	-
Carbon																					
	Soil Organic Matter (SOM)	TM132	%	<0.35	8.96	6.52	-	22.4	29.3	5.12	2.72	7.4	-	8.76	0.552	11.5	8.4	12.9	11.9	6.05	6.15
Inorganics																					
	pH	TM133	pH Units	<1	7.22	7.86	-	7.06	7.41	6.64	6.86	6.64	-	7.12	6.97	7.24	7	6.99	6.99	8.21	8.11
	Cyanide, Total	TM153	mg/kg	<1	-	<1	-	-	<1	-	-	-	-	-	<1	<1	-	-	-	-	<1
	Thiocyanate	TM153	mg/kg	<1	-	<1	-	-	<1	-	-	-	-	-	<1	1.59	-	-	-	-	<1
Metals																					
	Chromium, Hexavalent	TM151	mg/kg	<0.6	<1.2	<1.2	-	<0.6	<0.6	<0.6	<1.2	<1.2	-	<0.6	<1.2	<1.2	<1.2	<1.2	<1.2	<0.6	<1.2
	Antimony	TM181	mg/kg	<0.6	-	<0.6	-	-	2.33	-	-	-	-	-	<0.6	4.23	-	-	-	-	<0.6
	Arsenic	TM181	mg/kg	<0.6	11.2	8.86	-	21.2	28.7	9.31	10.8	16.2	-	22.6	6	19	7.44	20.9	20.3	11.2	9.57
	Barium	TM181	mg/kg	<0.6	128	153	-	136	177	87.6	65.1	187	-	240	135	245	75.2	129	148	106	101
	Beryllium	TM181	mg/kg	<0.01	2.08	1.31	-	2.9	4.12	1.67	0.685	1.68	-	2.13	0.853	2.52	0.909	1.41	1.57	1.25	1.34
	Cadmium	TM181	mg/kg	<0.02	0.817	1.44	-	1.73	2.26	0.576	0.318	0.869	-	1.46	0.0988	1.32	0.539	0.76	1.11	0.326	0.328
	Chromium	TM181	mg/kg	<0.9	32.6	25.4	-	23	19.9	16.3	13.7	17.8	-	18.3	27	20.3	14.1	19.8	22.5	24.5	19.9
	Copper	TM181	mg/kg	<1.4	72.9	61.3	-	86.8	101	36.6	19	45	-	75.9	18.2	91.8	35.9	82.9	84.6	46.9	41.1
	Lead	TM181	mg/kg	<0.7	74.4	37.6	-	99.5	130	31.2	19.2	147	-	249	11.5	161	29.9	110	111	43.4	38.2
	Mercury	TM181	mg/kg	<0.14	<0.14	<0.14	-	<0.14	<0.14	<0.14	<0.14	<0.14	-	<0.14	<0.14	0.162	<0.14	<0.14	<0.14	<0.14	<0.14
	Nickel	TM181	mg/kg	<0.2	27.4	27.4	-	46.6	53.3	20.2	16.4	27.4	-	29.7	18.2	28	16.1	22.3	25.9	26.6	19.9
	Selenium	TM181	mg/kg	<1	1.04	1.12	-	1.49	1.68	<1	<1	1.21	-	1.51	1.07	1.07	<1	<1	1.24	<1	<1
	Vanadium	TM181	mg/kg	<0.2	60.6	71.9	-	53	49.4	30.5	21.2	34.5	-	25.4	29.8	24.7	19.1	22.6	29.3	56.8	32.1
	Zinc	TM181	mg/kg	<1.9	166	203	-	376	482	89.5	48.8	190	-	703	43.5	430	109	317	308	135	100
	Boron, water soluble	TM222	mg/kg	<1	1.19	1	-	3.4	4.63	1.03	<1	<1	-	1.19	<1	1.56	1.22	<1	1.24	<1	<1
Phenols																					
	Phenol	TM062 (S)	mg/kg	<0.01	-	0.0106	-	-	<0.01	-	-	-	-	-	<0.01	<0.01	-	-	-	-	<0.01
Gasoline Range Organics (GRO)																					
	Aliphatics >C5-C6	TM089	µg/kg	<10	-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aliphatics >C6-C8	TM089	µg/kg	<10	-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aliphatics >C8-C10	TM089	µg/kg	<10	-	<10	38	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aliphatics >C10-C12	TM089	µg/kg	<10	-	<10	124	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Total Aliphatics >C5-C12	TM089	µg/kg	<10	-	<10	162	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aromatics >C6-C7	TM089	µg/kg	<10	-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aromatics >C7-C8	TM089	µg/kg	<10	-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aromatics >EC8-EC10	TM089	µg/kg	<10	-	<10	57	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Aromatics >EC10-EC12	TM089	µg/kg	<10	-	<10	186	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Total Aromatics >C6-C12	TM089	µg/kg	<10	-	<10	244	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	GRO Surrogate % recovery**	TM089	%		-	27	63	-	10	-	50	-	-	-	123	29	-	-	-	-	54

	Benzene	TM089	µg/kg	<10		-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Toluene	TM089	µg/kg	<2		-	<2	<2	-	<2	-	<2	-	-	-	<2	<2	-	-	-	-	<2
	Ethylbenzene	TM089	µg/kg	<3		-	<3	<3	-	<3	-	<3	-	-	-	<3	<3	-	-	-	-	<3
	m,p-Xylene	TM089	µg/kg	<6		-	<6	<6	-	<6	-	<6	-	-	-	<6	<6	-	-	-	-	<6
	o-Xylene	TM089	µg/kg	<3		-	<3	<3	-	<3	-	<3	-	-	-	<3	<3	-	-	-	-	<3
	m,p,o-Xylene	TM089	µg/kg	<10		-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	BTEX, Total	TM089	µg/kg	<10		-	<10	<10	-	<10	-	<10	-	-	-	<10	<10	-	-	-	-	<10
	Methyl tertiary butyl ether (MTBE)	TM089	µg/kg	<5		-	<5	<5	-	<5	-	<5	-	-	-	<5	<5	-	-	-	-	<5
	GRO >C5-C12	TM089	µg/kg	<44		-	<44	406	-	<44	-	<44	-	-	-	<44	<44	-	-	-	-	<44
Speciated EPH CWG																						
	Aliphatics >C12-C16	TM173	µg/kg	<100		-	8930	215	-	15400	-	149	-	-	-	443	5170	-	-	-	-	<100
	Aliphatics >C16-C21	TM173	µg/kg	<100		-	8450	<100	-	17700	-	<100	-	-	-	869	4670	-	-	-	-	3110
	Aliphatics >C16-C35	TM173	µg/kg	<100		-	49700	<100	-	75800	-	280	-	-	-	2500	30000	-	-	-	-	31500
	Aliphatics >C21-C35	TM173	µg/kg	<100		-	41200	<100	-	58100	-	280	-	-	-	1630	25400	-	-	-	-	28400
	Aliphatics >C35-C44	TM173	µg/kg	<100		-	9670	<100	-	9950	-	<100	-	-	-	<100	4590	-	-	-	-	57600
	Total Aliphatics >C12-C44	TM173	µg/kg	<100		-	68300	215	-	101000	-	429	-	-	-	2940	39800	-	-	-	-	89100
	Aromatics >EC12-EC16	TM173	µg/kg	<100		-	7670	<100	-	21900	-	<100	-	-	-	617	6480	-	-	-	-	7590
	Aromatics >EC16-EC21	TM173	µg/kg	<100		-	20100	<100	-	61000	-	<100	-	-	-	966	19800	-	-	-	-	16200
	Aromatics >EC21-EC35	TM173	µg/kg	<100		-	53200	<100	-	152000	-	<100	-	-	-	2220	68200	-	-	-	-	76900
	Aromatics >EC35-EC44	TM173	µg/kg	<100		-	21100	<100	-	36600	-	<100	-	-	-	701	23900	-	-	-	-	168000
	Aromatics >EC40-EC44	TM173	µg/kg	<100		-	7940	<100	-	13700	-	<100	-	-	-	181	8670	-	-	-	-	87500
	Total Aromatics >EC12-EC44	TM173	µg/kg	<100		-	102000	<100	-	271000	-	<100	-	-	-	4500	118000	-	-	-	-	269000
	Aliphatics >C35-C40	TM173	µg/kg	<100		-	6270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27000
	Aliphatics >C40-C44	TM173	µg/kg	<100		-	3400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30600
	Total Aliphatics >C12-C35	TM173	µg/kg	<100		-	58600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31500
	Total Aliphatics >C12-C40	TM173	µg/kg	<100		-	64900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58500
	Total Aliphatics & Aromatics >C12-C44	TM173	µg/kg	<100		-	170000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	358000
TPH Criteria Working Group (TPH CWG																						
	Total Aliphatics >C5-C44	TM173	µg/kg	<100		-	68300	377	-	101000	-	429	-	-	-	2940	39800	-	-	-	-	89100
	Total Aromatics >C6-C44	TM173	µg/kg	<100		-	102000	244	-	271000	-	<100	-	-	-	4500	118000	-	-	-	-	269000
	Total Aliphatics & Aromatics >C5-C44	TM173	µg/kg	<100		-	170000	621	-	372000	-	429	-	-	-	7440	158000	-	-	-	-	358000
	Total Aliphatics >C5-35	TM173	µg/kg	<100		-	58600	377	-	91200	-	429	-	-	-	2940	35200	-	-	-	-	31500
	Total Aromatics >C5-35	TM173	µg/kg	<100		-	81000	244	-	235000	-	<100	-	-	-	3800	94500	-	-	-	-	101000
	Total Aliphatics & Aromatics >C5-35	TM173	µg/kg	<100		-	140000	621	-	326000	-	429	-	-	-	6740	130000	-	-	-	-	132000
Semi-Volatile Organic Compounds (SV																						
	Phenol	TM157	µg/kg	<100		-	<100		-	<100	-		-	-	-	<100	<100	-	-	-	-	<100
	Pentachlorophenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	n-Nitroso-n-dipropylamine	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Nitrobenzene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Isophorone	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Hexachloroethane	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Hexachlorocyclopentadiene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Hexachlorobutadiene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Hexachlorobenzene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	n-Dioctyl phthalate	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Dimethyl phthalate	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Diethyl phthalate	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	n-Dibutyl phthalate	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Dibenzofuran	TM157	µg/kg	<100		-	<100	-	-	243	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Carbazole	TM157	µg/kg	<100		-	<100	-	-	182	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Butylbenzyl phthalate	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	bis(2-Ethylhexyl) phthalate	TM157	µg/kg	<100		-	<100	-	-	224	-	-	-	-	-	<100	268	-	-	-	-	<100
	bis(2-Chloroethoxy)methane	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	bis(2-Chloroethyl)ether	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	Azobenzene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Nitrophenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Nitroaniline	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Methylphenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Chlorophenylphenylether	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Chloroaniline	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Chloro-3-methylphenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	4-Bromophenylphenylether	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	3-Nitroaniline	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	2-Nitrophenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	2-Nitroaniline	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	2-Methylphenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	1,2,4-Trichlorobenzene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	2-Chlorophenol	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	2,6-Dinitrotoluene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100
	2,4-Dinitrotoluene	TM157	µg/kg	<100		-	<100	-	-	<100	-	-	-	-	-	<100	<100	-	-	-	-	<100

	2,4-Dimethylphenol	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	2,4-Dichlorophenol	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	2,4,6-Trichlorophenol	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	2,4,5-Trichlorophenol	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	1,4-Dichlorobenzene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	1,3-Dichlorobenzene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	1,2-Dichlorobenzene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	2-Chloronaphthalene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	2-Methylnaphthalene	TM157	µg/kg	<100		<100			152							<100	<100						<100
	Acenaphthylene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	Acenaphthene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	Anthracene	TM157	µg/kg	<100		148			290							<100	150						<100
	Benzo(a)anthracene	TM157	µg/kg	<100		755			713							<100	896						136
	Benzo(b)fluoranthene	TM157	µg/kg	<100		818			779							<100	823						151
	Benzo(k)fluoranthene	TM157	µg/kg	<100		756			583							<100	839						141
	Benzo(a)pyrene	TM157	µg/kg	<100		1090			769							<100	1250						187
	Benzo(g,h,i)perylene	TM157	µg/kg	<100		570			442							<100	720						121
	Chrysene	TM157	µg/kg	<100		874			917							<100	1030						192
	Fluoranthene	TM157	µg/kg	<100		1440			2030							<100	1660						261
	Fluorene	TM157	µg/kg	<100		<100			<100							<100	<100						<100
	Indeno(1,2,3-cd)pyrene	TM157	µg/kg	<100		585			386							<100	700						<100
	Phenanthrene	TM157	µg/kg	<100		655			1870							<100	736						171
	Pyrene	TM157	µg/kg	<100		1220			1580							<100	1570						238
	Naphthalene	TM157	µg/kg	<100		<100			203							<100	<100						<100
	Dibenzo(a,h)anthracene	TM157	µg/kg	<100		147			<100							<100	133						<100
Volatile Organic Compounds (VOCs)																							
	Dibromofluoromethane**	TM116	%			110			115							105	119						104
	Toluene-d8**	TM116	%			81.8			78.6							98.7	88.2						86.9
	4-Bromofluorobenzene**	TM116	%			154			162							108	157						151
	Dichlorodifluoromethane	TM116	µg/kg	<4		<4			<4							<4	<4						<4
	Chloromethane	TM116	µg/kg	<7		<7			<7							<7	<7						<7
	Vinyl Chloride	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Bromomethane	TM116	µg/kg	<13		<13			<13							<13	<13						<13
	Chloroethane	TM116	µg/kg	<14		<14			<14							<14	<14						<14
	Trichlorofluoromethane	TM116	µg/kg	<6		<6			<6							<6	<6						<6
	1,1-Dichloroethene	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Carbon Disulphide	TM116	µg/kg	<7		<7			<7							<7	<7						<7
	Dichloromethane	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Methyl Tertiary Butyl Ether	TM116	µg/kg	<11		<11			<11							<11	<11						<11
	trans-1-2-Dichloroethene	TM116	µg/kg	<11		<11			<11							<11	<11						<11
	1,1-Dichloroethane	TM116	µg/kg	<8		<8			<8							<8	<8						<8
	cis-1-2-Dichloroethene	TM116	µg/kg	<5		<5			<5							<5	<5						<5
	2,2-Dichloropropane	TM116	µg/kg	<12		<12			<12							<12	<12						<12
	Bromochloromethane	TM116	µg/kg	<14		<14			<14							<14	<14						<14
	Chloroform	TM116	µg/kg	<8		<8			<8							<8	<8						<8
	1,1,1-Trichloroethane	TM116	µg/kg	<7		<7			<7							<7	<7						<7
	1,1-Dichloropropene	TM116	µg/kg	<11		<11			<11							<11	<11						<11
	Carbontetrachloride	TM116	µg/kg	<14		<14			<14							<14	<14						<14
	1,2-Dichloroethane	TM116	µg/kg	<5		<5			<5							<5	<5						<5
	Benzene	TM116	µg/kg	<9		<9			10.2							<9	16						<9
	Trichloroethene	TM116	µg/kg	<9		<9			<9							<9	<9						<9
	1,2-Dichloropropane	TM116	µg/kg	<12		<12			<12							<12	<12						<12
	Dibromomethane	TM116	µg/kg	<9		<9			<9							<9	<9						<9
	Bromodichloromethane	TM116	µg/kg	<7		<7			<7							<7	<7						<7
	cis-1-3-Dichloropropene	TM116	µg/kg	<14		<14			<14							<14	<14						<14
	Toluene	TM116	µg/kg	<5		<5			10.9							<5	15.4						8.31
	trans-1-3-Dichloropropene	TM116	µg/kg	<14		<14			<14							<14	<14						<14
	1.1.2-Trichloroethane	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	1.3-Dichloropropane	TM116	µg/kg	<7		<7			<7							<7	<7						<7
	Tetrachloroethene	TM116	µg/kg	<5		6.24			<5							<5	7.64						7.54
	Dibromochloromethane	TM116	µg/kg	<13		<13			<13							<13	<13						<13
	1.2-Dibromoethane	TM116	µg/kg	<12		<12			<12							<12	<12						<12
	Chorobenzene	TM116	µg/kg	<5		<5			<5							<5	<5						<5
	1.1.1.2-Tetrachloroethane	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Ethylbenzene	TM116	µg/kg	<4		<4			20.5							<4	<4						16.1
	p/m-Xylene	TM116	µg/kg	<14		<14			<14							<14	<14						<14
	o-Xylene	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Styrene	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Bromoform	TM116	µg/kg	<10		<10			<10							<10	<10						<10
	Isopropylbenzene	TM116	µg/kg	<5		<5			<5							<5	<5						<5

	1.1.2.2-Tetrachloroethane	TM116	µg/kg	<10		<10			<10						<10	<10					<10
	1.2.3-Trichloropropane	TM116	µg/kg	<17		<17			<17						<17	<17					<17
	Bromobenzene	TM116	µg/kg	<10		<10			<10						<10	<10					<10
	Propylbenzene	TM116	µg/kg	<11		<11			<11						<11	<11					<11
	2-Chlorotoluene	TM116	µg/kg	<9		<9			<9						<9	<9					<9
	1.3.5-Trimethylbenzene	TM116	µg/kg	<8		<8			<8						<8	<8					<8
	4-Chlorotoluene	TM116	µg/kg	<12		<12			<12						<12	<12					<12
	tert-Butylbenzene	TM116	µg/kg	<12		<12			<12						<12	<12					<12
	1.2.4-Trimethylbenzene	TM116	µg/kg	<9		<9			<9						<9	<9					<9
	sec-Butylbenzene	TM116	µg/kg	<10		<10			<10						<10	<10					<10
	4-Isopropyltoluene	TM116	µg/kg	<11		<11			<11						<11	<11					<11
	1.3-Dichlorobenzene	TM116	µg/kg	<6		<6			<6						<6	<6					<6
	1.4-Dichlorobenzene	TM116	µg/kg	<5		<5			<5						<5	<5					<5
	n-Butylbenzene	TM116	µg/kg	<10		<10			<10						<10	<10					<10
	1.2-Dichlorobenzene	TM116	µg/kg	<12		<12			<12						<12	<12					<12
	1.2-Dibromo-3-chloropropane	TM116	µg/kg	<14		<14			<14						<14	<14					<14
	Tert-amyl methyl ether	TM116	µg/kg	<15		<15			<15						<15	<15					<15
	1.2.4-Trichlorobenzene	TM116	µg/kg	<6		<6			<6						<6	<6					<6
	Hexachlorobutadiene	TM116	µg/kg	<12		<12			<12						<12	<12					<12
	Naphthalene	TM116	µg/kg	<13		<13			<13						25.2	<13					<13
	1.2.3-Trichlorobenzene	TM116	µg/kg	<6		<6			<6						<6	<6					<6

ALcontrol Laboratories

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Grontmij
Radcliffe House
3rd Floor
Blenheim Court, Lode lane
Solihull
West Midlands
B912AA

Attention: Gareth Taylor

CERTIFICATE OF ANALYSIS

Date:	17 December 2010
Customer:	H_GRONTMIJ_SOL
Sample Delivery Group (SDG):	101214-8
Your Reference:	
Location:	Brownhill Project
Report No:	108329

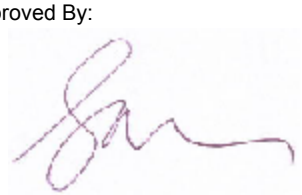
We received 5 samples on Tuesday December 14, 2010 and 5 of these samples were scheduled for analysis which was completed on Friday December 17, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:



Sonia McWhan

Laboratory Manager

1291

CERTIFICATE OF ANALYSIS

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2576625	13 JEROME ROAD			10/12/2010
2575330	152 BURNTWOOD ROAD			10/12/2010
2575341	16 BURNTWOOD ROAD			10/12/2010
2576626	18 JEROME DRIVE			10/12/2010
2576621	21 YEW TREE CLOSE			10/12/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Test Schedule

LIQUID

Results Legend

X — Test

N — No Determination Possible

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			2576625	13 JEROME ROAD			1l green glass bottle
			2575341	16 BURNTWOOD ROAD			Vial
			2576626	18 JEROME DRIVE			1l green glass bottle
			2576621	21 YEW TREE CLOSE			Vial
			2575330	152 BURNTWOOD ROAD			1l green glass bottle
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 5	X	X	X	X	X
EPH (DRO) (C10-C40) Aqueous (W)	All	NDPs: 0 Tests: 5	X	X	X	X	X
GRO by GC-FID (W)	All	NDPs: 0 Tests: 5	X	X	X	X	X
Mercury Dissolved	All	NDPs: 0 Tests: 5	X	X	X	X	X
pH Value	All	NDPs: 0 Tests: 5	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	16 BURNTWOOD ROAD	152 BURNTWOOD ROAD	18 JEROME DRIVE	13 JEROME ROAD	21 YEW TREE CLOSE
			Depth (m)	.	.	.	.	.
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010
			Date Received	14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010
			SDG Ref	101214-8	101214-8	101214-8	101214-8	101214-8
			Lab Sample No.(s)	2575341	2575330	2576626	2576625	2576621
			AGS Reference					
Antimony (diss.filt)	<0.16 µg/l	TM152		0.531 #	0.165 #	<0.16 #	1.61 #	<0.16 #
Arsenic (diss.filt)	<0.12 µg/l	TM152		0.535 #	0.508 #	0.48 #	0.8 #	0.518 #
Boron (diss.filt)	<9.4 µg/l	TM152		59 #	71 #	62.8 #	64.1 #	67.6 #
Cadmium (diss.filt)	<0.1 µg/l	TM152		<0.1 #	<0.1 #	<0.1 #	0.184 #	<0.1 #
Chromium (diss.filt)	<0.22 µg/l	TM152		8.94 #	9.11 #	8.6 #	8.69 #	8.83 #
Copper (diss.filt)	<0.85 µg/l	TM152		32.5 #	5.49 #	203 #	47.9 #	45 #
Lead (diss.filt)	<0.02 µg/l	TM152		0.074 #	0.108 #	0.099 #	0.211 #	0.061 #
Nickel (diss.filt)	<0.15 µg/l	TM152		1.23 #	1.12 #	2.01 #	1.71 #	1.2 #
Zinc (diss.filt)	<0.41 µg/l	TM152		8.93 #	7.52 #	35.8 #	43.1 #	17.7 #
EPH Range >C10 - C40 (aq)	<46 µg/l	TM172		<46 #	<46 #	<46 #	<46 #	<46 #
EPH Band >C10-C12 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C12-C16 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C16-C21 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C21-C28 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C35-C40 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
EPH Band >C28-C35 (aq)	<10 µg/l	TM172		<10	<10	<10	<10	<10
Mercury (diss.filt)	<0.01 µg/l	TM183		<0.01 #	<0.01 #	<0.01 #	<0.01 #	<0.01 #
pH	<1 pH Units	TM256		8.07 #	8.06 #	8.07 #	8.08 #	8 #

CERTIFICATE OF ANALYSIS

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

GRO by GC-FID (W)

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	16 BURNTWOOD ROAD	152 BURNTWOOD ROAD	18 JEROME DRIVE	13 JEROME ROAD	21 YEW TREE CLOSE
			Depth (m)	.	.	.	.	.
			Sample Type	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)	Water(GW/SW)
			Date Sampled	10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010
			Date Received	14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010
			SDG Ref	101214-8	101214-8	101214-8	101214-8	101214-8
			Lab Sample No.(s)	2575341	2575330	2576626	2576625	2576621
			AGS Reference					
GRO >C5-C12	<50 µg/l	TM245		<50 #	<50 #	<50 #	<50 #	<50 #
Methyl tertiary butyl ether (MTBE)	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #
Benzene	<7 µg/l	TM245		<7 #	<7 #	<7 #	<7 #	<7 #
Toluene	<4 µg/l	TM245		<4 #	<4 #	<4 #	<4 #	<4 #
Ethylbenzene	<5 µg/l	TM245		<5 #	<5 #	<5 #	<5 #	<5 #
m,p-Xylene	<8 µg/l	TM245		<8 #	<8 #	<8 #	<8 #	<8 #
o-Xylene	<3 µg/l	TM245		<3 #	<3 #	<3 #	<3 #	<3 #
m,p,o-Xylene	<10 µg/l	TM245		<10	<10	<10	<10	<10
BTEX, Total	<10 µg/l	TM245		<10	<10	<10	<10	<10

CERTIFICATE OF ANALYSIS

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM172	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	EPH in Waters		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM245	By GC-FID	Determination of GRO by Headspace in waters		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	2575341	2575330	2576626	2576625	2576621
Customer Sample Ref.	16 BURNTWOOD ROAD	152 BURNTWOOD ROAD	18 JEROME DRIVE	13 JEROME ROAD	21 YEW TREE CLOSE
AGS Ref.					
Depth					
Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Dissolved Metals by ICP-MS	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010
EPH (DRO) (C10-C40) Aqueous (W)	16-Dec-2010	16-Dec-2010	16-Dec-2010	16-Dec-2010	16-Dec-2010
GRO by GC-FID (W)	17-Dec-2010	17-Dec-2010	17-Dec-2010	17-Dec-2010	17-Dec-2010
Mercury Dissolved	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010
pH Value	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010	15-Dec-2010

SDG:	101214-8	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108329
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not
accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute themajor part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOXTHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOXTHERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOXTHERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOXTHERM	GC-MS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH CWG BY GC	D&C	HEXANE/ACETONE	END OVER END	GC-FID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GC-MS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GC-MS
C8-C40 (C8-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GC-EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GC-EZ
SEMI VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GC-MS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH-MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC-MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC-MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC-MS
PHENOLS-MS	DCM	SOLID PHASE EXTRACTION	GC-MS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

ALcontrol Laboratories

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Grontmij
Radcliffe House
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Blenheim Court, Lode lane
Solihull
West Midlands
B912AA

Attention: Gareth Taylor

CERTIFICATE OF ANALYSIS

Date:	16 November 2010		
Customer:	H_GRONTMIJ_SOL-24		
Sample Delivery Group (SDG):	101115-39	**Report No.:**	103422
Your Reference:			
Location:			

We received 7 samples on Saturday November 13, 2010 and 7 of these samples were scheduled for analysis which was completed on Tuesday November 16, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

Iain Swinton

Business Director - Land, UK & Ireland

Validated

ALcontrol Laboratories Analytical Services

SDG:	101115-39	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-24	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:		**Report No:**	103422

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2402181	A1		0.30	12/11/2010
2402194	A2		0.10	12/11/2010
2402217	A3		0.50	12/11/2010
2402227	A4		0.10	12/11/2010
2402237	A5		0.50	12/11/2010
2402244	A6		0.30	12/11/2010
2402254	A7		0.10	12/11/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	101115-39	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-24	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:		**Report No:**	103422

SOLID

Results Legend

X — Test

N — No Determination Possible

			Lab Sample No(s)	2402181	2402194	2402217	2402227	2402237	2402244	2402254
			Customer Sample Ref.	A1	A2	A3	A4	A5	A6	A7
			AGS Ref.							
			Depth (m)	0.30	0.10	0.50	0.10	0.50	0.30	0.10
			Container	250g Amber Jar	250g Amber Jar	250g Amber Jar	250g Amber Jar	250g Amber Jar	250g Amber Jar	250g Amber Jar
Asbestos Containing Material Screen	All	NDPs: 0 Tests: 7		X	X	X	X	X	X	X

Validated

ALcontrol Laboratories Analytical Services

SDG:	101115-39	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-24	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:		**Report No:**	103422

Test Completion Dates

Lab Sample No(s)	2402181	2402194	2402217	2402227	2402237	2402244	2402254
Customer Sample Ref.	A1	A2	A3	A4	A5	A6	A7
AGS Ref.							
Depth	0.30	0.10	0.50	0.10	0.50	0.30	0.10
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Asbestos Containing Material Screen	16/11/2010	16/11/2010	16/11/2010	16/11/2010	16/11/2010	16/11/2010	16/11/2010

Validated

ALcontrol Laboratories Analytical Services

SDG:	101115-39	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-24	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:		**Report No:**	103422

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	A1	A2	A3	A4	A5	A6
			Depth (m)	0.30	0.10	0.50	0.10	0.50	0.30
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	12/11/2010	12/11/2010	12/11/2010	12/11/2010	12/11/2010	12/11/2010
			Date Received	13/11/2010	13/11/2010	13/11/2010	13/11/2010	13/11/2010	13/11/2010
			SDG Ref	101115-39	101115-39	101115-39	101115-39	101115-39	101115-39
			Lab Sample No.(s)	2402181	2402194	2402217	2402227	2402237	2402244
			AGS Reference						
Asbestos Containing Material Screen	-	TM001		No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected	No ACM Detected

Validated

ALcontrol Laboratories Analytical Services

SDG:	101115-39	**Customer:**	Grontmij
Job:	H_GRONTMIJ_SOL-24	**Attention:**	Gareth Taylor
Client Reference:		**Order No.:**	
Location:		**Report No:**	103422

Results Legend	
#	ISO17025 accredited.
M	*m*CERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	Depth (m)	Sample Type	Date Sampled	Date Received	SDG Ref	Lab Sample No.(s)	AGS Reference
			A7	0.10	Soil/Solid	12/11/2010	13/11/2010	101115-39	2402254	
Asbestos Containing Material Screen	-	TM001	No ACM Detected							

Table of Results - Appendix

SDG Number : 101115-39 **Client :** H_GRONTMIJ_SOL **Client Ref :**

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
TM001	In - house Method	Determination of asbestos containing material by screening on solids		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

ALcontrol Laboratories

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B912AA

Attention: Gareth Taylor

CERTIFICATE OF ANALYSIS

Date:	16 December 2010
Customer:	H_GRONTMIJ_SOL
Sample Delivery Group (SDG):	101214-13
Your Reference:	
Location:	Brownhill Project
Report No:	108241

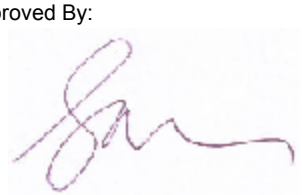
We received 5 samples on Tuesday December 14, 2010 and 5 of these samples were scheduled for analysis which was completed on Thursday December 16, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:



Sonia McWhan

Laboratory Manager

CERTIFICATE OF ANALYSIS

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
2575389	TP1		0.30 - 0.30	10/12/2010
2575390	TP2		0.40 - 0.40	10/12/2010
2575391	TP3		0.30 - 0.30	10/12/2010
2575392	TP4		0.50 - 0.50	10/12/2010
2575393	TP5		0.40 - 0.40	10/12/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Test Schedule

SOLID

Results Legend

X Test

N No Determination Possible

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
			2575389	TP1		0.30 - 0.30	250g Amber Jar
			2575390	TP2		0.40 - 0.40	250g Amber Jar
			2575391	TP3		0.30 - 0.30	250g Amber Jar
			2575392	TP4		0.50 - 0.50	250g Amber Jar
			2575393	TP5		0.40 - 0.40	250g Amber Jar
PAH by GCMS	All	NDPs: 0 Tests: 5	X	X	X	X	X
Sample description	All	NDPs: 0 Tests: 5	X	X	X	X	X

CERTIFICATE OF ANALYSIS

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
2575389	TP1	0.30 - 0.30	Dark Brown	Loamy Sand	0.063 - 0.1 mm	Stones	Vegetation
2575390	TP2	0.40 - 0.40	Black	Sandy Loam	0.063 - 0.1 mm	Vegetation	Stones
2575391	TP3	0.30 - 0.30	Dark Brown	Sandy Loam	0.063 - 0.1 mm	Stones	Vegetation
2575392	TP4	0.50 - 0.50	Dark Brown	Loamy Sand	0.063 - 0.1 mm	Stones	Vegetation
2575393	TP5	0.40 - 0.40	Dark Brown	Loamy Sand	0.063 - 0.1 mm	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

PAH by GCMS

Results Legend

#	ISO17025 accredited.
M	*m*CERTS accredited.
§	Non-conforming work.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample R	TP1	TP2	TP3	TP4	TP5
			Depth (m)	0.30 - 0.30	0.40 - 0.40	0.30 - 0.30	0.50 - 0.50	0.40 - 0.40
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	10/12/2010	10/12/2010	10/12/2010	10/12/2010	10/12/2010
			Date Received	14/12/2010	14/12/2010	14/12/2010	14/12/2010	14/12/2010
			SDG Ref	101214-13	101214-13	101214-13	101214-13	101214-13
			Lab Sample No.(s)	2575389	2575390	2575391	2575392	2575393
			AGS Reference					
Naphthalene-d8 % recovery**	%	TM218		99.2	98.3	103	92.3	99
Acenaphthene-d10 % recovery**	%	TM218		98.4	96.8	101	91.1	98.1
Phenanthrene-d10 % recovery**	%	TM218		95.6	94.4	98.3	89.4	95.7
Chrysene-d12 % recovery**	%	TM218		91.8	90.5	94	87.9	93
Perylene-d12 % recovery**	%	TM218		94.1	90.8	93.7	90.4	93.9
Naphthalene	<9 µg/kg	TM218		49.5 M	105 M	83.5 M	125 M	51.6 M
Acenaphthylene	<12 µg/kg	TM218		22.2 M	32.5 M	26.1 M	130 M	28.5 M
Acenaphthene	<8 µg/kg	TM218		<8 M	13.2 M	32.7 M	24.8 M	<8 M
Fluorene	<10 µg/kg	TM218		<10 M	15.8 M	43.3 M	23 M	14.2 M
Phenanthrene	<15 µg/kg	TM218		356 M	584 M	1180 M	638 M	454 M
Anthracene	<16 µg/kg	TM218		68.6 M	104 M	343 M	196 M	77 M
Fluoranthene	<17 µg/kg	TM218		581 M	1100 M	1790 M	1530 M	755 M
Pyrene	<15 µg/kg	TM218		474 M	900 M	1340 M	1370 M	615 M
Benz(a)anthracene	<14 µg/kg	TM218		307 M	537 M	763 M	925 M	366 M
Chrysene	<10 µg/kg	TM218		308 M	539 M	694 M	800 M	375 M
Benzo(b)fluoranthene	<15 µg/kg	TM218		592 M	924 M	990 M	1640 M	658 M
Benzo(k)fluoranthene	<14 µg/kg	TM218		191 M	297 M	378 M	529 M	239 M
Benzo(a)pyrene	<15 µg/kg	TM218		309 M	547 M	647 M	1110 M	382 M
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218		257 M	385 M	413 M	825 M	296 M
Dibenzo(a,h)anthracene	<23 µg/kg	TM218		66.7 M	107 M	122 M	207 M	79.5 M
Benzo(g,h,i)perylene	<24 µg/kg	TM218		354 M	518 M	534 M	1050 M	402 M
Polyaromatic hydrocarbons, Total	<118 µg/kg	TM218		3940 M	6710 M	9390 M	11100 M	4790 M

CERTIFICATE OF ANALYSIS

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Table of Results - Appendix

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	2575389	2575390	2575391	2575392	2575393
Customer Sample Ref.	TP1	TP2	TP3	TP4	TP5
AGS Ref.					
Depth	0.30 - 0.30	0.40 - 0.40	0.30 - 0.30	0.50 - 0.50	0.40 - 0.40
Type	SOLID	SOLID	SOLID	SOLID	SOLID
PAH by GCMS	16-Dec-2010	16-Dec-2010	16-Dec-2010	16-Dec-2010	16-Dec-2010
Sample description	14-Dec-2010	14-Dec-2010	14-Dec-2010	14-Dec-2010	14-Dec-2010

SDG:	101214-13	**Location:**	Brownhill Project	**Order Number:**	
Job:	H_GRONTMIJ_SOL-43	**Customer:**	Grontmij	**Report Number:**	108241
Client Reference:		**Attention:**	Gareth Taylor	**Superseded Report:**	

Appendix

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample -similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.

8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient/unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

12. Results relate only to the items tested

13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors
employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not
accredited.

19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

20. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

21. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

22. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

23. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials -whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute themajor part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

24. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 -C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
SOLVENT EXTRACTABLE MATTER	D&C	DCM	SOXTHERM	GRAVIMETRIC
CYCLOHEXANE EXT. MATTER	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
THIN LAYER CHROMATOGRAPHY	D&C	DCM	SOXTHERM	IATROSCAN
ELEMENTAL SULPHUR	D&C	DCM	SOXTHERM	HPLC
PHENOLS BY GCMS	WET	DCM	SOXTHERM	GC-MS
HERBICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
PESTICIDES	D&C	HEXANE/ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (MIN OIL)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH (CLEANED UP)	D&C	HEXANE/ACETONE	END OVER END	GC-FID
EPH CWG BY GC	D&C	HEXANE/ACETONE	END OVER END	GC-FID
PCB TOT / PCB CON	D&C	HEXANE/ACETONE	END OVER END	GC-MS
POLYAROMATIC HYDROCARBONS (MS)	WET	HEXANE/ACETONE	MICROWAVE TM218.	GC-MS
C8-C40 (C8-C40) EZ FLASH	WET	HEXANE/ACETONE	SHAKER	GC-EZ
POLYAROMATIC HYDROCARBONS RAPID GC	WET	HEXANE/ACETONE	SHAKER	GC-EZ
SEMI VOLATILE ORGANIC COMPOUNDS	WET	DCM/ACETONE	SONICATE	GC-MS

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH-MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC-MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC-MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC-MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC-MS
PHENOLS-MS	DCM	SOLID PHASE EXTRACTION	GC-MS
TPH by INFRARED (IR)	TCE	LIQUID/LIQUID SHAKE	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID SHAKE	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -
Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX E

Well	Date	Peak CH4 %	Steady CO2 %	O2 %	H2S ppm	CO ppm	Flow l/hr
WS A	28/07/2010	<det lim	3.5	17.2	0	0	-0.2
	11/08/2010	<det lim	2.7	14.7	0	0	0
	25/08/2010	<det lim	4.7	13.6	0	0	0.1
	08/09/2010	<det lim	3.2	15.3	0	0	-0.1
WS B	28/07/2010	<det lim	15.3	17.5	1	0	-0.1
	11/08/2010	<det lim	0.1	17.1	0	0	0.1
	25/08/2010	<det lim	15.3	0.1	0	0	0.1
	08/09/2010	<det lim	3.2	15.3	0	0	0.1
WS C	28/07/2010	<det lim	1	16.8	0	0	-0.1
	11/08/2010	<det lim	0.7	17.1	0	0	-0.1
	25/08/2010	<det lim	0.1	17.4	0	0	0.1
	08/09/2010	<det lim	1.8	16.1	0	0	0.1
WS D	28/07/2010	<det lim	2.8	16.6	0	0	-0.1
	11/08/2010	<det lim	1.6	15.8	0	0	-0.1
	25/08/2010	<det lim	5.7	11.6	0	0	0.1
	08/09/2010	<det lim	2.1	15.1	0	0	0.1
WS E	28/07/2010	<det lim	no access				
	11/08/2010	<det lim	no access				
	25/08/2010	<det lim	2	16.2	0	0	0.1
	08/09/2010	<det lim	no access				
WS F	28/07/2010	<det lim	0.8	17.7	0	0	-0.1
	11/08/2010	<det lim	0.1	17.5	0	0	-0.1
	25/08/2010	<det lim	1.5	16.1	0	0	0.1
	08/09/2010	<det lim	1.6	13.9	0	0	0.1
WS G	28/07/2010	<det lim	5.2	16.4	0	0	-0.1
	11/08/2010	<det lim	3.5	15.3	0	0	-0.1
	25/08/2010	<det lim	4.5	13.9	0	0	0.1
	08/09/2010	<det lim	no access				
WS H	28/07/2010	<det lim	4.6	17.2	0	2	-0.2
	11/08/2010	<det lim	4.3	14.1	0	0	-0.1
	25/08/2010	<det lim	6.2	12.2	0	0	0.1
	08/09/2010	<det lim	6.4	12.2	0	0	0.1
WS J	28/07/2010	<det lim	0.8	17.4	1	0	-0.2
	11/08/2010	<det lim	0.1	17.6	0	0	-0.1
	25/08/2010	<det lim	1.4	16.3	0	0	0.1
	08/09/2010	<det lim	1.2	16.4	0	0	0.1
WS K	28/07/2010	<det lim	2.2	17	0	0	-0.1
	11/08/2010	<det lim	2.1	15.3	0	0	0.1
	25/08/2010	<det lim	3.5	14.3	0	0	0.1
	08/09/2010	<det lim	2.4	14.9	0	0	-0.1

APPENDIX F

Appendix F: Severity and Probability of Risk in Conceptual Site Models (after CIRIA552, Tables 6.3 to 6.5)

This report draws on guidance presented in CIRIA report 552, "Contaminated Land Risk Assessment, A Guide for Good Practice", wherein the "severity" term in the Conceptual Site Model is classified with reference to the sensitivity of the hazard and the receptor, as follows:

Situation	Severity Category	Description	Examples
ACUTE PROBLEM	Severe	Acute risk to human health likely to result in "significant harm" as defined in EPA90, catastrophic damage to buildings or property, acute risk of major pollution of controlled waters, acute risk of harm to ecosystems (as defined in Contaminated Land Regulations 2006)	High cyanide concentrations at the surface of a recreation area Major spillage into controlled waters Explosion, causing building collapse
SIGNIFICANT HARM TO SENSITIVE RECEPTOR	Medium	Chronic risk to human health likely to result in "significant harm" as defined in EPA90, chronic pollution of sensitive controlled waters, significant change at a sensitive ecosystems or species, significant damage to buildings or structures	Contaminant concentrations at a site in excess of SGVs, GAC or similar screening values Leaching of contaminants to sensitive aquifer Death of a species within a nature reserve
SIGNIFICANT HARM TO LESS SENSITIVE RECEPTOR	Mild	Pollution of non-sensitive waters, significant damage to buildings, structures, services or crops, damage to sensitive buildings, structures, services or the environment, which nonetheless result in "significant harm"	Pollution to (former) non-aquifer or to non-controlled surface watercourse. Damage to building rendering it unsafe to occupy (e.g. foundation or structural damage)
NON-SIGNIFICANT HARM	Minor	Harm, not necessarily resulting in "significant harm" but probably requiring expenditure to resolve or financial loss. Non-permanent risks to human health that are easily mitigated, e.g. by wearing PPE. Easily-repairable damage to structures or services	Contaminant concentrations requiring the wearing of PPE during site work, but no other long-term mitigation. Discolouration of concrete

The likelihood of an event (probability) takes into account both the presence of hazard and receptor and the integrity of the pathway between hazard and receptor, and is assessed as follows:

Category	There is a pollution linkage and:
High	Event is likely in the short term and almost inevitable over the long term. Or, there is evidence of actual harm at/to the receptor
Likely	Event is possible in the short term and likely over the long term
Low	Event is unlikely in the short term and possible over the long term
Unlikely	Event is unlikely, even in the long term

Potential severity and probability have been assessed in the following matrix, to give an overall risk rating:

	Severity			
Probability	Severe	Medium	Mild	Minor
High	Very high	High	Moderate	Low/moderate
Likely	High	Moderate	Low/moderate	Low
Low	Moderate	Low/moderate	Low	Very low
Unlikely	Low/moderate	Low	Very low	Very low

The above risk categories are likely to result in the following actions:

- Very high: urgent intervention / investigation needed, remediation likely to be required
- High: urgent intervention / investigation needed, remediation possibly required in short term and probably required in long term
- Moderate: investigation needed to clarify and refine risk; remediation may be required over the long term
- Low: it is possible that harm could arise to a receptor, but if realised, such harm is likely to be, at worst, mild
- Very low: it is possible that harm could arise to a receptor, but if realised, such harm is unlikely to be severe

APPENDIX G

Appendix G – Likely Lifetime Asbestos Burden

The following table is extracted from World Health Organisation (WHO) Air Quality Guidelines 2000. It demonstrates that a member of the public, in an urban setting, is likely to inspire around 15000000 critical asbestos fibres (i.e. fibres of "ideal" length and diameter to reach the lungs) within a 70 year lifetime.

Whilst always desirable to minimise exposure to asbestos fibres, the table puts the discovery of asbestos fibres in one sample, of five tested, in a residential rear garden. Such fibres in the garden are unlikely to be frequently disturbed, and are unlikely to significantly add to the fibre burden over a lifetime of exposure.

Table 1. Lifetime fibre burdens typical for industrial countries

Population[a] (%)	Subgroup	Fibre concentration (F/m^3)[b]	Exposure time (years)	Inhaled volume (m^3/year)	Accumulated critical fibres (F > 5 µm)
70	Urban population (moderate exposure)	30	70	7300	$\sim 1.5 \times 10^7$
25	Rural population	10	70	7300	10^5 - 10^6
5	Urban population (high exposure)	200	70	7300	$\sim 10^8$
1-2	General construction workers	$10^3 - 10^5$ [c]	50	2000	$10^8 - 10^{10}$ [c]
0.1	Asbestos workers	$10^5 - 10^6$ [c]	50	2000	$10^{10} - 10^{11}$ [c]
	Irregular exposure (example)	10^4	0.7	7300	5×10^7

[a] These percentages reflect an assumed population distribution.
[b] F >5 µm.
[c] Fibre count with optical microscope.